AGRICULTURAL ENGINEERING

Established 1920

This Journal is owned, edited, and published monthly by the American Society of Agricultural Engineers.

Editorial and advertising departments at the executive office of the Society, Saint Joseph, Michigan. Publication office at Benton Harbor, Michigan.

SUBSCRIPTION PRICE: $3.00 a year, plus an extra postage charge to all countries to which the second-class postage rate does not apply; to A.S.A.E. members anywhere, $2.00 a year. Single copies (current), 30 cents each.

POST OFFICE ENTRY: Entered as second-class matter, October 28, 1933, at the post office at Benton Harbor, Michigan, under the Act of August 24, 1912. Additional entry at St. Joseph, Michigan. Acceptance for mailing at the special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized August 11, 1921.

CONTENTS FOR JANUARY 1944

Vol. 25, No. 1

EDITORIAL

Important If True

PUBLICATION of "Plowman's Folly" by Faulkner, and particularly the appearance of an abstract thereof for cursory popular reading, have served to put the conventional moldboard plow on trial in a considerable segment of the public mind. Indeed, it seems to stand convicted in some of the comment heard from persons whose interest in agriculture is purely academic.

Even though, as seems to us, Faulkner's position is that of the enthusiast and protagonist, he has rendered a great service to the cause of soil conservation and the advance of agriculture by projecting the whole question into public consciousness through the sheer impact of his inspired writing. By arousing the ire of many an agricultural engineer and agronomist he accelerates research and stimulates the sifting of fact from fancy in determining the adaptability of his doctrine to actual farm practice.

In dramatic contrast to all this is the article by R. A. Norton *et al* which begins on the page opposite. That this appears at a moment to furnish mild rebuke to the overly enthusiastic on both sides of the question is mere coincidence. Obviously the years of study cited were programmed far ahead of Faulkner and his furore. Our present authors and our whole profession may well thank Mr. Faulkner and "Readers' Digest" for what in the vernacular is called a build-up.

Norton and his colleagues have done more than make a notable progress report in what promises to be an epochal, if limited, change in farming practice. They point out the need for more extensive research at the fastest possible pace if the findings are to be of most use in the re-equipment of agriculture in the postwar period. If ever there were a problem calling for the closest cooperation between the agencies of public research and the management of the farm machinery industry, this is it.

Hay Burns the Midnight Oil

FORAGE crop handling, more especially its hauling and storing phases, came near stealing the show at the fall meeting of the American Society of Agricultural Engineers in Chicago last month. Scheduled as an evening round table, it taxed the seating and even the standing capacity of the meeting room and ran for 150 minutes of the most intensive discussion. Seldom has such an amount of tangible data been so well organized and so swiftly presented.

Most noteworthy was the close collaboration of engineers in the colleges and other public agencies with those of industry in a constructive cross fire of comment and criticism. No longer can it be said that haying is the most neglected phase of farming. Nor can it be said that this focus of attention on forage handling problems has solved them. It has emphasized their difficulty and given impetus and direction for their further attack.

While due attention was given to the obvious objective of greater results per man hour of limited labor available, the discussion never lost sight of what is perhaps a greater wartime objective — greater saving of nutritional values, notably of the protein which is perhaps the most critical material in the food program. We suspect that no conference of a similar number of men has contributed so much to the sum total of food production.

Which Is the Happy Mean?

AT various times through the years, veteran members of the American Society of Agricultural Engineers have risen during discussion of papers and test data during meetings of the Society to challenge the too-easy use of averages. At least twice has been cited the legend of the hunter who fired one barrel to the right of the rabbit, the other barrel an equal distance to the left, and according to the alleged law of averages killed the rabbit.

As we prepare technical articles for publication in these pages we find most use made of the ordinary average, or arithmetic mean. To an increasing but still minor extent we find the use of median values. We have been wondering increasingly whether, in a goodly fraction of instances, a sounder and more useful figure would be furnished by the geometric or logarithmic mean. Our feeling has been fortified by a few personal experiences in which the geometric mean has seemed to arrive at more rational results.

Far from foisting this as a dictum on our fellows, we confess our ignorance of statistical science; in consequence we invite for publication a rather brief and simple exposition of the several sorts of mean with particular reference to their suitability for the situations arising in the subject matter of agricultural engineering.

Plow vs. Poison

OBVIOUSLY, any system of tillage without clean plowing comes to a natural boundary where there is any serious crop pest, such as the corn borer, which completes its life cycle in a cover of trash. This may re-open for engineering attention the whole field of pest control by poison or other chemical means. Equipment and methods for this purpose might well be extended to chemical control of certain weeds which threaten to be a problem in unplowed land.

The Rabbit Rises Again

IN general reference to the quotation and comment on this page in prior months regarding the rabbit-like propensities and predicament of agricultural engineers (not as such but as part of the so-called white-collar class), an A.S.A.E. member calls to our attention an organization which he considers worthy of mention to his colleagues. It is the Investors Fairplay League with headquarters office in New York City and regional offices in a few other cities.

To us the name seems unfortunate, having a plutocratic suggestion quite different from the purposes and the people which the League avowedly exists to serve. It might more descriptively be designated as a "Society to Represent Old-Fashioned Thrift in a Modern World." Its declared program of service is for owners of savings deposits, insurance policies, homes, small businesses, and stocks or bonds laid away as investments.

Even if we knew enough about this organization to do so, our policy would not permit us to give it any endorsement or special encouragement. What earns so much as this mention is the fact that it is headed by B. C. Forbes, a name which to us is its own proof of probity and a promise of sound, practical purpose. How well it may serve the personal interests of agricultural engineers is for them to judge by personal inquiry.

AGRICULTURAL ENGINEERING

Vol. 25 JANUARY 1944 No. 1

Present Status of the Plow as a Tillage Implement

By R. A. Norton, E. V. Collins, and G. M. Browning

MEMBER A.S.A.E. MEMBER A.S.A.E.

THE plow has been recognized as the basic implement for primary preparation of seedbeds for intertilled crops for many years. This implement is displayed prominently on the great seals of many states of the Union to symbolize their agricultural resources. We are reminded by Keen[6]* that the different kinds of implements used in soil cultivation have all developed from a pointed stick, the function of which was to stir and break up the soil. While cultivators and harrows are in the direct line of descent from the pointed stick, the plow represents a divergence from the line, in that its purpose is to invert the soil rather than to stir it.

Davidson and Chase[2] have traced progress in plow design, in some detail, from the earliest times through the development of the curved moldboard in the early eighteenth century and the coming of the steel plow a little over a hundred years ago to the modern sulky and gang plows. In comparatively recent times careful studies have been conducted at the Alabama Agricultural Experiment Station[3, 8, 9] to determine principles which could be used in perfecting the shape of the moldboard.

It was only about five years ago that the desirability of plowing as the basic tillage operation in humid regions began to be questioned seriously. Wright[16] at the University of Oxford introduced the matter with a challenge. He pointed out that well over a half century of mechanical cultivation had brought about no appreciable change of method and suggested that this must mean either that the farmer is overconservative in his attitude toward new developments or that traditional methods are so essentially sound as to be virtually incapable of improvement. His countrymen had already given some thought to the matter, since almost simultaneously with Wright's paper Russel and Keen[11] presented a summary of several years' results at the Rothamsted Experimental Station, drawing the main conclusion that in any one year a farmer can, with little if any loss of crop, cut out or telescope a number of cultivation operations; but if he tries to prepare a seedbed for several years in succession without beginning with the traditional plowing, he may run into certain secondary troubles such as deterioration of yield because of increased weediness.

Probably the sharpest attack on the moldboard plow has originated in our own country. Faulkner[5] suggests that most of our agricultural difficulties may be solved by eliminating the moldboard plow which places residues of the previous crop at the bottom of

Paper presented at the fall meeting of the American Society of Agricultural Engineers at Chicago, December, 1943. A contribution of the Power and Machinery and Soil and Water Divisions.

Journal Paper No. J-1166 of the Iowa Agricultural Experiment Station. Project No. 737, cooperative with the Soil Conservation Service, U. S. Department of Agriculture.

E. V. COLLINS is research professor of agricultural engineering, Iowa Agricultural Experiment Station. R. A. NORTON and G. M. BROWNING are soil conservationists (research), Soil Conservation Service, U. S. Department of Agriculture.

AUTHORS' NOTE: The authors are indebted to Dr. J. B. Davidson, head, agricultural engineering section, Iowa Agricultural Experiment Station, for suggestions and assistance during their investigations and in the preparation of this paper.

*Superscript numbers indicate references appended to this paper.

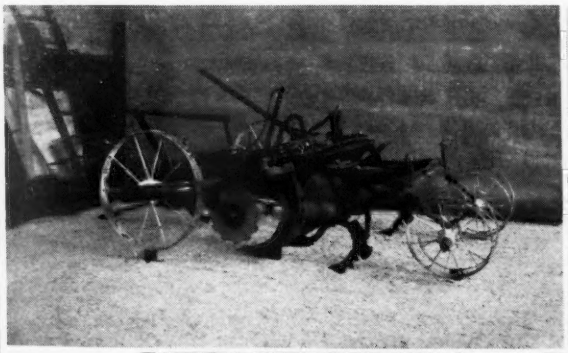


Fig. 1 (Upper left) A subsoil lister. An 8-in cultivator sweep tills the soil in the bottom of the lister furrow to a depth of 3 to 4 in • Fig. 2 (Upper right) Mounted hard-ground lister as used in the investigations near Clarinda, Iowa. A planter attachment may be mounted just behind the lister bottoms and primary seedbed preparation and planting may proceed as simultaneous operations if desired • Fig. 3 (Lower left) The lister bottoms were replaced by 45-in sweeps to perform the subsurface tillage operations for mulch culture of corn • Fig. 4 (Lower right) Primary preparation of land for corn by means of two 45-in sweeps attached to a mounted hard-ground lister frame

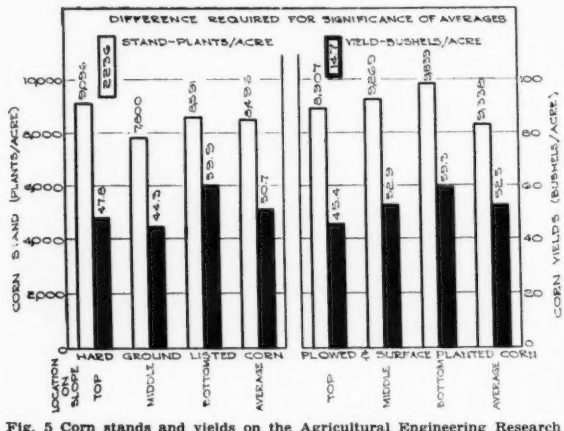


Fig. 5 Corn stands and yields on the Agricultural Engineering Research Farm, Ames, Iowa, 1943. Previous crop, fall-plowed sweet clover. The stands were counted on entire plots. Yield data represent the means of five sampling areas in each plot. Sampling locations representative of the entire plot were located at random

the furrow. He would substitute tillage practices whereby the residues are mixed with the surface layers of the soil or kept near the soil surface.

It is the purpose of this paper to show that investigations which will point the way to improved tillage methods for intertilled crops have been in progress for some time and, specifically to report the results of investigations on the effect of different cultural treatments and methods of handling crop residues on the Clarion loam and the Webster clay loam soils of the Agricultural Engineering Research Farm near Ames, Iowa, from 1939 through 1943, and on the Marshall silt loam at the Soil Conservation Experimental Farm near Clarinda, Iowa, during 1942 and 1943.

Recent investigations in regions of the United States where rainfall is limited have shown the desirability of retaining crop residues on the soil surface to help control wind and water erosion, increase infiltration and reduce evaporation[4, 10, 15].

The disk harrow was used (in 1939 only) at Ames as a primary tillage tool in preparing land for corn. It was found[5] that this practice resulted in yield reductions of about 3 bu per acre on each of two fields where the yields by plowing were 60.9 and 85.9 bu per acre, respectively. On the latter field labor requirements for preparation of seedbed and planting were reduced from 1.17 min per bu on the plowed plots to 0.77 min per bu on the disked plots. Likewise power requirements were reduced from 0.19 hp-hr per bu to 0.11 hp-hr per bu.

Lister-Planter Method of Corn Culture. The lister, with various modifications, has been studied at Ames, Iowa, for several years to determine its suitability for primary seedbed preparation for corn[12]. The yields obtained by means of this implement have been erratic, but the labor and power requirements per acre for seedbed preparation, planting, and cultivation are lower by about 17 per cent and 34 per cent, respectively, than where the plow is used[13]. In spite of the reduction in costs, the lister-planter method of corn culture has not been considered well adapted to central Iowa soils and climate. Much of the difficulty apparently has been encountered on the comparatively flat, imperfectly drained soils of the Webster series which are usually closely associated with the more rolling Clarion soils. The heavy soil on the lower ground was often so wet and sticky in the bottom of the furrow at planting time that a good seedbed could not be prepared in one operation.

To overcome some of the difficulties just mentioned a new experimental machine called a subsoil lister (Fig. 1) was tried for seedbed preparation in 1940. Good results were obtained that year as reported by Browning, Norton, and Shedd[1]. Yields of 63.9 and 82.2 bu per acre obtained by plowing on two different fields were topped slightly by the yields from corresponding lister-planted areas. But another trial in 1941 showed unfavorable results due to an exceptionally wet June.

In 1943 this machine was tried again but this time the rows were put on the contour in an attempt to retain the water where it fell and prevent waterlogging of the low-lying areas of the field. The results of this study are presented in Fig. 5. It will be noted that, although the average yields were slightly lower on the listed plots than on those which were plowed and surface planted, this reduction resulted from a comparatively poor yield in one plot only where the stand of listed corn was sparse. The entire area occupied by this test had been plowed in the fall of 1942. At planting time in the spring of 1943, much residue from the previous sweet clover crop remained at plow depth. This material interfered with the operation of the lister which is intended for use on unplowed land.

Mulch Culture vs. Plowing and Listing. The same authors reported on yields of corn following several different crops where mulch culture was compared with plowing near Ames in 1941 and near Clarinda, Iowa, in 1942 and 1943. Hard-ground listing and loose-ground listing on the contour were included in the study near Clarinda since listing is an accepted practice in southwestern Iowa. At Ames the subsurface cultivator was used to prepare the seedbed of the mulch-culture plots, while at Clarinda 45-in sweeps were attached to tractor-mounted lister beams (Figs. 2, 3, and 4). None of the results were very favorable to mulch culture from a yield standpoint, but time studies at Ames revealed that the seedbed could be prepared and planting completed on subsurface-tilled areas in only a little more than one-half the time and with less than three-fourths the expenditure for power required on plowed land.

At Clarinda it was found that the soil loss from subsurface-tilled plots, where red clover had been grown the previous year, averaged 9.9 tons per acre in the first nine months of 1943. This may be compared to 34.1 tons per acre from the plots which were plowed and surface-planted. The water loss from subsurface-tilled plots was 20 per cent greater than from the plowed plots. The soil and water losses from contour-listed corn were practically negligible. This agrees with earlier work at the same location on contour listing for continuous corn[7].

In the spring of 1943 a study was initiated to compare corn production by mulch culture and hard-ground listing on terraced land on Marshall silt loam soil. The results for the first year of this test are presented in Fig. 6. The fact that two different vertical spacings of terraces are involved has no bearing on the problem at hand. All terraced areas were planted with the same planter, but the machine may not have been as well adapted to planting through residues as are some planters used at other locations. Other factors, besides the treatment itself, which may account for some of the reduction in yield under mulch culture were unavailability of entirely satisfactory cultivation equipment and looseness of the seedbed at planting time. Excessively wet, cool weather the early part of June, which was unfavorable for nitrification, permitted weeds to get a good start and interfered with cultivation. As this study progresses, the machinery difficulties will be eliminated to permit a fairer comparison of the two treatments.

Detailed Mulch Culture Studies at Ames. In 1942 three experimental fields, each carrying a 3-year rotation of corn, corn, oats-sweet clover catch crop were established. Seven treatments are com-

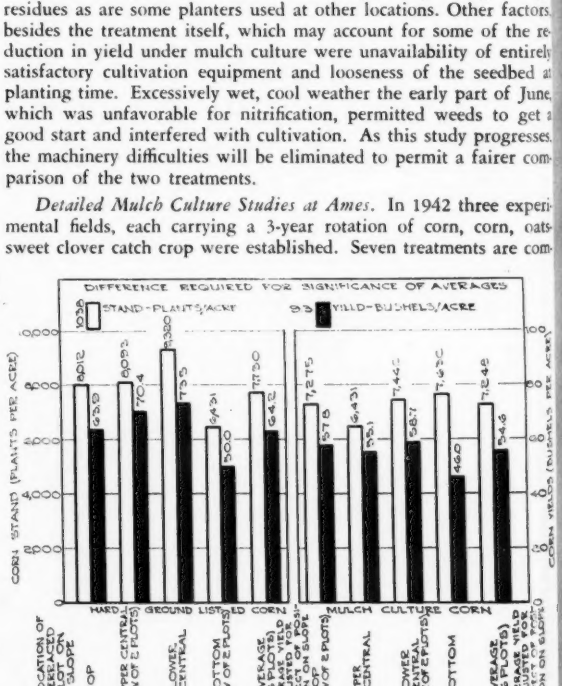


Fig. 6 Corn stands and yields from terraced areas on the Experimental farm in Page County, Iowa, 1943. Previous crop, corn. The data represent average yield from three sampling sites located at random within each terraced area

pared in a long-time replicated plot experiment. The treatments were shown in a brief preliminary report by Shedd and Norton[14] which was presented at the annual meeting of the American Society of Agricultural Engineers at Purdue University in June, 1943, but they will be repeated here for clarity in connection with data which follow:

S1S — Normal amount of residue on surface; seedbed preparation by subsurface cultivator

S2S — Twice the normal amount of residue on surface; seedbed preparation by subsurface cultivator

S2SN — Three times the normal amount of residue on surface; seedbed preparation by subsurface cultivator. (Treatment of these plots was changed in 1943 to twice the normal amount of residue plus application of commercial nitrogen fertilizer)

SO — Residue removed; seedbed preparation by subsurface cultivator

PO — Residue removed; seedbed preparation by plow, tandem-disk harrow, and spike-tooth harrow

P1S — Residue removed; plowed; residue returned to surface; final seedbed preparation by subsurface cultivator

P1U — Residue plowed under; final seedbed preparation by tandem-disk harrow and spike-tooth harrow (conventional practice).

Plant heights were measured at a critical stage of corn growth early in July (Fig. 7). Although only a few differences in height between individual treatments were statistically significant, real differences were found when the average height of corn on all plowed plots (P) representing a particular combination of soil and previous crop was compared with the average height on all subsurface-tilled plots (S) in the same series.

Where significant differences in plant height were found between any two treatments similar differences were usually observed between yields as shown in Fig. 8. In other words, where corn growth was inhibited at or just before the time of pollination it never recovered. Many of the plants showed evidences of nutritional deficiencies which on the basis of observed color of foliage and preliminary laboratory tests, have tentatively been diagnosed as potash starvation. This condition was most noticeable on the Webster soils, particularly on the plots where extra quantities of cornstalk residue were added (S2S and S2SN) but it could be observed without difficulty where only the normal residue was present (S1S). Wind damaged the corn on all plots late in July of both years and hail had a part in the damage in 1943, so all yields are considerably lower than would be expected on soils which the plots occupy.

The important thing to note here is that while comparatively satisfactory yields may be obtained by subsurface tillage on the Clarion soils they are often strongly depressed on the Webster soils. Since these soils are usually closely associated, no cultural practice should be recommended for one of them unless it is found reasonably effective for both. However, mulch culture may be practiced in such a way that no depression in yield results. If the residues are removed from the land before plowing and replaced after plowing (treatment P1S) the yields have been found to compare favorably with those obtained by the conventional plowing and surface planting (treatment P1U) regardless of the season, the kind of residue, or the soil.

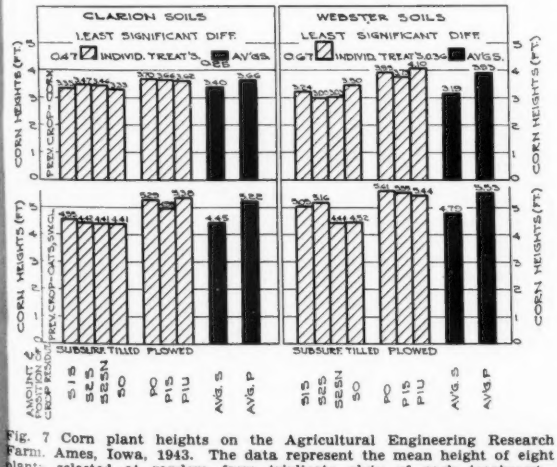


Fig. 7 Corn plant heights on the Agricultural Engineering Research Farm, Ames, Iowa, 1943. The data represent the mean height of eight plants selected at random from triplicate plots of each treatment

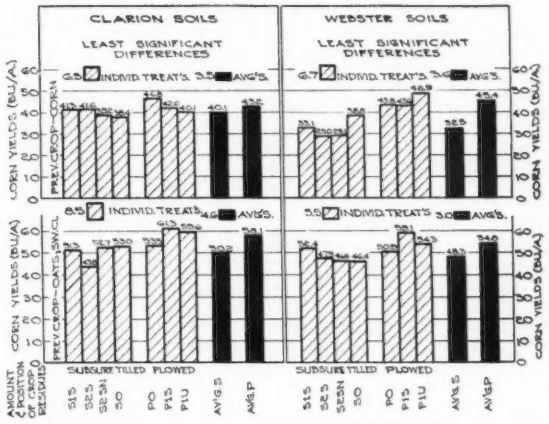


Fig. 8 Corn yields on the Agricultural Engineering Research Farm, Ames, Iowa. The data for corn following corn represent the mean yields from six plots of each treatment in 1942 and three plots of each treatment in 1943. Data for corn following oats - sweet clover represent the mean yields from three plots of each treatment in 1943 only. Yields were obtained by harvesting entire plots with a mechanical picker

Evidence on the Weed Problem. Unexpected information was obtained from a field of soybeans on the Agricultural Engineering Research Farm near Ames in 1943. The field had been used for a study of plowing compared with four types of mulch culture of corn last year. It was plowed and drilled to soybeans in 7-in rows this year. No particular attention was paid to it until late summer when light and dark strips were observed extending across the field in the direction of the old corn plots. Upon relocation of the plot boundaries it was found that the dark strips coincided with the areas which had been plowed for corn in the fall of 1941. These plots were decidedly more weedy and the soybeans were less mature than on those where corn had been grown by mulch culture methods.

After the soybeans matured yields were sampled on each of the plots and the data are presented in Fig. 9. The best yields were observed where preparation was by the subsurface cultivator the previous spring. Soybeans following subsoil listing of corn yielded nearly as well and apparently would have taken the lead except that for some unexplained reason one plot among five handled in this manner yielded very poorly.

Results of the study leave us without evidence on what would have happened if the plots had been prepared for soybeans by some mulch culture treatment and point to the need for further investigation of the problem.

DISCUSSION

From the evidence presented, subsurface cultivators and sweep attachments for listers are not satisfactory substitutes for the plow for primary preparation of the seedbed for corn under the conditions of these experiments. The presence of crop residues on the surface of the land is no detriment to yield provided suitable planters and cultivators are available. If a simple, economical machine can be developed, which is capable of stirring the soil thoroughly, possibly inverting it beneath the layer of residue, many of the difficulties will probably be dispelled.

It has been pointed out that recent studies to perfect the steel moldboard plow have been carried on even after more than a century of use. We should be willing to give careful consideration to new machines or cultural methods, even though they tend to depart rather widely from accepted practice.

Contour listing may find a place as a modified mulch-culture practice on some of the more rolling lands of the corn belt. Where the lister has previously been tested and discarded, the trials have usually been made on straight rows. Contour ridges of earth laid at close intervals on hilly land have proved effective in reducing

soil and water losses on lands in the Missouri River valley. Preliminary tests have been initiated on several soils in central and eastern Iowa to determine feasibility of the practice under a wider range of conditions. To prevent stand and yield reductions, the lister may require further modification and improvement to insure a satisfactory seedbed.

The disk harrow was used one year (1939) at Ames for primary preparation of a seedbed for corn and warrants further investigation. While, in more recent years, an attempt has been made to keep the residues on the soil surface, it cannot be shown from the data available that some mixing of the residue with the soil is deleterious. It may even tend to overcome some of the nutritional deficiencies which, in 1943, apparently hampered the development of corn soon after planting.

The European corn borer has spread rapidly in Iowa during the past year. Clean plowing is one of the recommended measures of control. Will subsurface tillage with residues on the surface, intensify the corn borer problem? The same question may be asked regarding the control of other insects that need trash for winter protection. It is evident that further studies on these problems are needed before new cultural methods can be recommended generally.

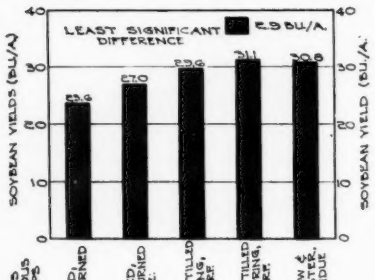


Fig. 9 Soybean yields on the Agricultural Engineering Research Farm, Ames, Iowa, 1943. Previous crop, corn (mulch culture tests). The data represent the mean yields from three sampling sites in five plots of each treatment

Insufficient data are available to prove that more weeds are present in corn fields which are subsurface tilled than in those which are plowed. This problem will require study on the same area over a period of years.

Considering the small differences in yield between plowed areas and those prepared by the previously mentioned alternate cultural methods, and assuming for the moment that plowing is the new practice under investigation, it is doubtful that very serious consideration would be given to a recommendation to change to plowing. Plowing is more expensive than many of the newer treatments under consideration. A farmer can ill afford to expend his energy and the power of his machines merely for the privilege of seeing his fields clear of all previous crop residues. This is especially true if by clean plowing the land is subjected to wind and water erosion. For these reasons it is important that new treatments be evaluated in terms of bushels per unit of energy expended and of erosion control as well as in bushels per acre.

Many farm machines are now wearing out and will have to be replaced as soon as possible after the war. Contemporary investigators of cultural methods have a particular responsibility at the present time to the farmer and to the farm machinery manufacturer. Evidence should be presented to aid them in deciding whether the tillage machines of the future are to be the same as those of the past. If this information can be obtained promptly, it may save these two groups from producing and purchasing new machinery which may be obsolete long before it is worn out.

SUMMARY

The results of the foregoing studies of cultural methods may be summarized as follows:

1 Differences in corn yield brought about by various cultural treatments were unimportant on Clarion soils when the previous crop was corn. Greater benefits were obtained when sweet clover was plowed under than when it was retained on the surface by subsurface tillage. On the Webster silty clay loam soil the yields were consistently higher from plots that were plowed than from subsurface-tilled areas.

2 When crop residues were removed from the land before plowing and replaced after plowing, corn yields were as good as or better than those obtained where residues were plowed under. An exception to this was noted on second-year corn on the Webster silty clay loam in 1943.

3 Yields were consistently higher on hard-ground listed areas than on subsurface-tilled areas on terraced land on the Marshall silt loam soil.

4 Corn plants on plowed plots on Clarion and Webster soils were significantly taller than on subsurface-tilled plots.

5 Contour-listed corn was nearly equa to plowed and surface-planted corn o Clarion loam in spite of a 9 per cent re duction in average stand.

6 On a soybean field, areas which ha been prepared for the previous crop by th subsurface cultivator and subsoil lister wer freer from weeds, the crop matured earlie and yields were significantly larger than o areas which had been prepared for the pre vious crop by plowing residues under.

7 By using mulch culture implement rather than the plow for primary seedbe preparation, it has been possible to reduc power and labor requirements for seedbe preparation and planting by one-third t one-half.

8 Some of the problems that may be me in studies of cultural treatments are indi cated and the need for further investigatio is emphasized.

REFERENCES

1 Browning, G. M., Norton, R. A., and Shedd, C. K. — Mulch culture in relation to soil and water conservation and corn yields in Iowa. Soil Science Soc. Amer. Proc. 8; ....., 1943.

2 Davidson, J. B. and Chase, L. W. — Farm machinery and farm motors. Orange Judd Co. 1920.

3 Doner, R. D. and Nichols, M. L. — Dynamics of soil on plow moldboard surfaces related to scouring. Agri. Engr. 15:9-13, 1934.

4 Duley, F. L. and Russel, J. C. — Effect of stubble mulching on soil erosion and runoff. Soil Sci. Soc. Amer. Proc. 7:77-81, 1942.

5 Faulkner, Edward H. — Plowman's Folly. Univ. of Oklahoma Press 1943.

6 Keen, B. A. — The functions of mechanical power in soil cultivation. Proceedings Institution of Automobile Engineers (England) 29:179-194, 1934.

7 Musgrave, G. W. and Norton, R. A. — Soil and water conservation investigations at the Soil Conservation Experiment Station, Missouri Valley Loess Region, Clarinda, Iowa. Progress Report 1931-1935. U. S. Dept. of Agr. Tech. Bull. 558, 1937.

8 Nichols, M. L. and Kummer, T. H. — A method of analysis of plow moldboard design based on dynamic properties of soil. Agri. Engr. 13:279-285, 1932.

9 Nichols, M. L. and Reed, I. F. — Physical reactions of soils to moldboard surfaces. Agri. Engr. 15:187-190, 1934.

10 Russel, J. C. — The effect of surface cover on soil moisture losses by evaporation. Soil Sci. Soc. Amer. Proc. 4:65-70, 1939.

11 Russell, E. W. and Keen, B. A. — Studies in soil conservation VII—The effect of cultivation on crop yield. Jour. Agric. Science (England) 28:212-233 (1938).

12 Shedd, C. K., Collins, E. V., and Davidson, J. B. — Labor, power and machinery in corn production. Iowa Agr. Expt. Sta. Bull. 365. 1937.

13 Shedd, C. K., Davidson, J. B., and Collins, E. V. — Machinery for growing corn. U. S. Dept. of Agr. Circ. 592, 1940.

14 Shedd, C. K. and Norton, R. A. — Machinery problems of mulch culture. Agri. Engr. 24:226, 230, 1943.

15 Sikes, Clarence C. — A report of stubble mulch tillage and other conservation measures used in the Pacific Northwest Region. Soil Conservation Service, U.S.D.A. (mimeographed) 1940.

16 Wright, S. J. — Farm implements and machinery: cultivating implements. Jour. Royal Agric. Soc. England 99: ....., 1938. (Reprint, original not seen).

Why Join a Professional Society?

WHY does one join a professional society? For the satisfaction derived from the associations, for the pleasure of acquaintances made and some warm friendships derived as a result of the contacts at meetings and through correspondence, for the joy of debate with one's equals or one's betters at meetings. These are all causes that have pleasure and a great value for young men and continued pleasurable satisfaction for the older ones. A prideful possession and prompt reading of the best writings in one's field also leads to a wish to have the society publications promptly and at first hand, which is the pleasure and privilege of a member. A reason less sentimentally compelling in our individualistic country is the favorable influence on one's standing which arises from officially ranging oneself alongside of professional and scientific fellows.

— *Dugald C. Jackson*

Farm Building Repair: A Challenge to Action

By Arthur W. Turner

PRESIDENT, AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS

FARM buildings, especially animal shelters and crop storages, form the keystone of the arch of America's wartime food program, the slogan of which is "Food Fights for Freedom." That may seem like a rash statement on first thought. But on further analysis, doesn't it seem foolish to talk about raising more food if we do not have adequate structures to store the crops, or adequate shelters to safeguard the baby chicks, lambs, calves, and newly farrowed pigs?

This country's job of producing more food is dependent on our facilities for storage and transportation. We hear occasionally of food losses in transit and storage in this country and in foreign lands. The quantities thus lost seem tremendous, but those losses are insignificant in comparison with that wasted daily in farm granaries and in feeding yards all over the country; yet the latter does not seem to cause widespread concern.

Uncounted food losses have occurred this past year. These losses are equal to or in excess of similar losses incurring in 1942 and also in 1941 when food production was close to average. But now the War Food Administration is asking for production on an additional 16 million acres of crop land. How are farmers going to take care of normal production without loss with the present number and condition of farm structures, let alone providing for the 1944 increases.

Unless everyone from the commander-in-chief of our armed forces to the farmer appreciates this situation — and *does* something about it — a lot of critical labor, equipment, and materials will be employed in vain in so far as delivering needed food is concerned.

Those of us in the farm equipment industry know that farm power units and machines must be kept in first-class condition to maintain normal production, and, furthermore, that additional power and machinery are essential if additional acres are to be put in crops. We have appreciated this for many years.

Following the first World War, I was one of the extension agricultural engineers in Iowa conducting "county tractor schools." Similar activity was then in progress in most of the so-called agricultural states. The object of these schools was to assist farm implement dealers and manufacturers in acquainting farmers with the use and maintenance of the new type of power units then coming rapidly into use.

Following this era, manufacturers conducted tractor schools for dealer's men and power farmers on the care and use of mechanical-power equipment. During this period the relationship between the extension agricultural engineers, manufacturers, dealers, and farmers increased — all for the purpose of aiding the farmer to keep his equipment on the job. The farm press inaugurated special columns devoted to farm power.

The next development was the introduction of tractor schools by the dealers themselves. Activity fanned out rapidly under this plan, the county agent and the extension agricultural engineer often appearing on dealers' programs. Manufacturers developed motion pictures for dealers' use and college extension staffs prepared pamphlets on mechanized farming and farm operating equipment.

Later, in 1927 and 1928, I sat in on some of the early conferences of our company, when we started developing tools and procedures for so-called "flat-rate schedules" for service and overhaul of tractors and farm machines. This activity developed the thousands of dealers throughout the nation as they became known as "servicing dealers" with their service stations. This also was reflected and promoted through the farm press.

Extension agricultural engineers expanded their activity to include broader use of equipment, more days use per year, etc. The high schools, with their vocational agriculture teachers, included courses in farm mechanics that promoted interest in mechanized equipment for boys who soon became farmers themselves.

I give this background to show how a general "farm machine consciousness," including care, operation, and repair (or "service" as it is now known), was created and developed over the years. Its first reaction, of course, was on the farmer. From there "tractors and farm machines" permeated the small rural towns, farm organizations, and, in fact, the so-called agricultural states. That perhaps was as far as we thought it needed to go.

There we were wrong. The importance of farm machinery in terms of food and later of war goods had not impressed the man on the street, persons engrossed in military tactics, or official Washington sufficiently to prevent drastic restrictions on the manufacture of tractors and machines after Japan attacked us two years ago. In fact, the manufacture of these vital war tools was almost eliminated for one year.

In one way this was beneficial. The farmers as one voice, from coast to coast and from Canada to the Gulf, demanded "Farm machines or return our boys to the farm." Food rationing was hinted, investigations were started, and surveys on food production machines were made. This continued, reviving "Repair Farm Machine" and "More Replacement Parts" programs until "farm machine repair" became a household term, in the city and farm press and on the radio. It became an objective of every agency — governmental, civic, and educational. It echoed and reechoed in the halls of the Congress so that today food and farm machines are almost synonomous terms in America.

Farm machinery has now become an important item in the plans of the United Nations. Let me quote from the USDA pamphlet "American Farmers and the United Nations Conference on Food and Agriculture" dated in August of this year; one statement summarizing food demands from American farmers reads: "If the United States is to carry out the proposed pledge to do all that is needed to assure adequate nutrition for its own people, it will need to increase the consumption of dairy products by almost 40 per cent, truck crops about 80 per cent, eggs more than 20 per cent, and fruit about 20 per cent above the average quantities consumed in 1935-39 . . . ."

Every one of those items is dependent on adequate animal shelters and crop storages, but in another paragraph commenting on how the other nations can help, we find this: "For these reasons, the food conference recommended that the countries not occupied by the enemy make effort during the short-term period to supply the devastated areas with this needed food and *means of producing food—machinery, fertilizer, seeds, and other production supplies.*" And in the paragraph following that is this statement: "Recent studies indicate that the production capacity of American farms is at least 10 per cent greater than is now being utilized, *assuming the necessary machinery, supplies, and labor can be obtained.*"

Even the delegates to the Conference are now convinced as to the machinery needs for producing crops, but there is no mention *any place in the pamphlet*, that I could find, about livestock facilities, poultry housing needs, or adequate storage for harvested grains, vegetables, fruits, etc.

Even the first draft of the federal government's outline for the "Food Fights for Freedom" campaign featured mainly farm machinery. I am sure there are men sitting in this meeting today who will gladly agree that it was members of the American Society of Agricultural Engineers who brought the importance of farm structures to the attention of the campaign committee. As president of the A.S.A.E., I was requested to appoint representatives from the farm structures and rural electric, as well as the power and machinery, divisions of the Society, to broaden the program to the end that all foodstuffs produced could be stored, transported, and processed. Those of you who attended the sessions of the A.S.A.E. fall meeting the first three days of this week heard reports from representatives of all three of these groups.

At this time I want especially to commend the two farm structures representatives, K. J. T. Ekblaw and W. G. Kaiser. Their efforts in organizing interest in farm structures has been outstanding. In a matter of a few months, they effected an organization that has brought the interest and enthusiasm to the point displayed

---

An address before the Farm Buildings Repair Conference sponsored jointly by the War Food Administration and the American Society of Agricultural Engineers at Chicago, December 10, 1943.

ARTHUR W. TURNER is educational adviser, International Harvester Co.

in this meeting. Our next job is to see that this enthusiasm results in action, and people the country over become "farm structures conscious" — *and do something about it!*

Now let's look at the mechanics of the power and machinery program. Basically, it is just a simple mathematics problem. If the farmer is to produce more food he needs more labor, or more power and equipment. War industries and the armed forces reduced the available farm labor supply, so that more power and machinery was essential. Next we realize that mechanical devices, large and small, wear and some parts will eventually have to be replaced. Tractors and farm machines are no exception. Increased use of farm machines, due to restricted manufacture, created a larger demand for replacement parts and accelerated the need for qualified personnel to do the maintenance and service work.

The state college extension staffs back in 1941 — not only the extension agricultural engineers but also other specialists—by radio, press and meetings had one motto, "Order Parts Early." A remarkable job was done even that first year in getting farmers to check their equipment, order necessary parts, and arrange for special work in advance.

The farm press promoted the campaign. A special appropriation by the Congress was made available to the Agricultural Education Service of the U. S. Office of Education for out-of-school classes in four skill courses—three mechanical and one woodworking. Through the cooperation of local implements dealers and others, I believe that machine repair and maintenance courses were the most popular, and all farmers became still more machinery conscious. The woodworking or carpentry course would have been more popular if the building supply manufacturers and their local dealers had appreciated the farmers' needs and their responsibility for cooperation with the schools.

The accelerated activity of educational agencies, press, radio, as well as industry, in the farm power and machinery programs, resulted in countless surveys by these groups, war boards, and others, until everyone knew the vital need of power and machines for crop production. More time was demanded of extension workers and the agricultural departments of high schools. Oil companies, rubber companies, manufacturers of component tractor parts — all climbed on the band wagon with booklets, charts, motion pictures, slide films, and what have you.

This activity has increased in each succeeding year of the war, until there is a generally recognized need to allocate larger quantities of critical materials to make critical machines (tractors and implements) to produce food — a critical war item.

FARM BUILDINGS ARE HIGHLY ESSENTIAL

So much for the picture relative to farm production tools. Yet no appreciable concern or interest was to be noted in the condition of farm buildings, especially animal shelters and crop storages, which constitute the keystone of the entire war emergency food program. The interest of everyone must be aroused to this fact. The more food that will be required is going to call for adequate structures.

Food requirements are mounting. Quoting again from the bulletin on the United Nations food conference, "In the years immediately following the war the disparity between demand and supply is likely to be even greater than it is now for a larger part of our supply will be needed for relief and rehabilitation in liberated countries. It is one of the ironies of this war, as far as the American people are concerned, that each victory makes our domestic food supply smaller unless we match expanded needs by expanded production."

It is obvious that the need for adequate farm structures will increase. We should exert every effort to take care of present facilities, and to determine what additional structures will be required for increased production. It is going to be an uphill job to create interest and to get action. It is a special challenge for you men here today, and I know you will accept it. There are two logical starting points, one from the manufacturer to the dealer and the other from educational agencies and the farm press to farmers and local agricultural services. Both must be unified to reach the desired goal. We do not have 25 years to build up a background as in the case of the tractor and farm machine activity.

One obstacle to be overcome lies in the fact that farm structures do not have the same dramatic appeal as does farm operating equipment. We all like to see wheels go round. A building is static while machines operating in the fields constantly remind owners of their importance. It is easy to delay building repairs. I have an example in my own home. Some spots on our floors need refinishing. I have been putting off that job from day to day for years. I wouldn't think of driving my car, even in these days, with a finish in the condition of that floor.

I, as well as the farmer, *must* be made "building repair" conscious. The farmer *must* realize that a leaking roof over hay or grain, rats in his granary, and so on are wasting large and valuable quantities of feed and foodstuffs he has labored to produce. Moreover these losses exceed those resulting from poor threshing, shelling, etc. The farmer *must* be made to picture these losses not only as so many bushels of grain, or dollars lost — not even in terms of so many farrowed pigs not raised — *but in the lives of American soldiers and sailors.* When farmers realize this, they will inspect their buildings and speak up to make their repair needs known. They will demand that building supplies commensurate with production requirements are made available.

When the farmer becomes building-repair conscious, he will demand more extension service counsel. He will demand special classes to aid him in keeping his buildings in repair. He will demand more vocational training for his boys now in school, and he will demand, and rightfully so, that the materials necessary to do the job be available when he needs them.

IMMEDIATE ACTION IS REQUIRED

The American Society of Agricultural Engineers is dedicated to "service to agriculture through engineering techniques." Farm structures and their maintenance is an important phase of such service. I am sure I speak for the Society's membership when I say that our organization will cooperate in this emergency and lend support to all interested agencies in developing a unified program.

We often hear the expression "Are you traveling, or going some place?" when we see a person with a piece of luggage. We generally pass it off as lightly as we say it. That is hardly right. One day last summer while walking down to a pier at a summer resort lake I met a "knight-of-the-road" with his earthly belongings in a red bandanna handkerchief. I glibly remarked: "Traveling, or going somewhere?" He replied in his carefree manner: "Just traveling, brother, just traveling."

I asked: "Where are you going now?"

Tramp replied: "Down to yon freight train. When it leaves I'll be on it."

I asked: "Where will the train take you?"

Tramp replied: "A generally westerly direction, brother, in just a general westerly direction."

I asked: "But where is your destination?"

Tramp replied: "That varies from day to day, depending who will take me where."

That concluded the conversation and I continued to the pier where two lads were raising the sails on their boat. It was a windy day so I inquired: "You boys don't intend to go out on this lake on a day like this, do you?"

Boys replied: "Why certainly, this is a splendid day for a sail."

I inquired: "But how will you get back in all this wind?"

Boys replied: "Get back? That's easy. We just handle our sails properly when the time comes and we can sail any place."

I inquired: "Can you go to that pier across the lake against this wind?"

Boys replied: "Certainly, we may have to tack back and forth, but if we pick our objective, we will get there."

And there you have it! The tramp was just traveling, but the boys were going somewhere. We must be sure this program you are discussing at this conference today is going some place.

The success of the farm building repair program — and it must succeed — depends on direction which in turn depends on organization. Building supply manufacturers need an agricultural viewpoint, one in which they appreciate their responsibility in the "Food Fights for Freedom" campaign, both to the farmer and to those in the armed forces.

Manufacturers will outline programs with means for motivating the dealers. The program will make progress as the building supply dealers become service conscious, com- *(Continued on page 16)*

Wartime Problems in Farm Building Construction

By Joseph W. Simons

MEMBER A.S.A.E.

ABOUT twenty months ago the first War Production Board order directly affecting construction was issued. Since that time many changes have occurred; the rapidity with which they have occurred has made it impossible at times for the average individual to be cognizant of current situations. On the whole, problems of regulation and distribution have become less complex as far as farm construction and building materials are concerned, but there are still many problems requiring intensive consideration. Agricultural engineers throughout the country have contributed to the solution of many of these problems, and it is hoped that these individuals and the American Society of Agricultural Engineers as a whole will continue in this worthwhile assistance. It is the purpose of this paper to review problems of wartime farm construction and to suggest ways in which this assistance can be given.

Estimating Requirements. The WFA has been charged with the responsibility of the food production and distribution program; more specifically the OMF must determine building and equipment needs essential to the production, storage, and processing of agricultural goods. One phase of this work is to develop programs which have as their primary objective the increasing of production of essential foods by securing a fair share of building materials, equipment, and operating supplies from the nation's stockpile of civilian goods. The WPB, of course, holds the key to the larder, and in order to obtain allotments of controlled materials, estimates of the quantities needed must be submitted and justification given to support claims. The WFA is constantly improving its methods of estimating and current data are being collected to provide a sound basis.

The problem of estimating involves several factors. Fire, flood, and tornado losses receive first consideration because, on the whole, the replacement of these facilities is essential to maintain present production. Normal maintenance and repair is of equal importance, while the amount of new construction needed for expansion is influenced by crop goals. Figures on lumber distribution and uses are of value as a measure of farm construction. Under present conditions lumber is the most critical single farm construction item and the extent to which lumber is being replaced by other materials must be considered. Current and future needs are fairly well indicated by records of construction applications.

The many methods by which materials can be obtained makes it more difficult to analyze material uses and distribution and to determine costs. For example, copper wire may be obtained under Conservation Order L-41, Priority Regulation 19, CMP Regulation 9, and by issuance of certificates by county committees. Steel products may be secured under L-41, PR-19, CMP-4, and L-257, and lumber under L-41 and M-208 or by certificates issued by county committees. During wartime salvage lumber is an important supplement to the supply of new materials but there is no way of determining its use or the quantities of controlled materials involved in its use.

A wartime committee has been organized within the A.S.A.E. for the purpose of estimating material requirements and of suggesting changes in programs related to farm construction, machinery, and supplies. It is felt that the committee will be able to make important contributions to this problem. However, I am sure that the committee or the WFA will welcome any suggestions individual members may have.

Restrictions of Order L-41. All construction is restricted by WPB Conservation Order L-41, and it might be well to review the channels through which an application for a farm building passes before it receives final action by the WPB. The field work, formerly carried out by USDA war boards, is done by state AAA committees. Working under the state committee is a similarly organized group in each county, called the County Agricultural Conservation Committee, the AAA representatives being farmers who were selected in that particular county for AAA work.

If a farmer desires to construct buildings or related facilities on his farm and this construction requires WPB approval, he must file a WPB application with the county committee having jurisdiction over the area in which his farm is located. He also provides the committee with information as to production on his farm, present facilities, and need for the proposed construction. The committee then judges the essentiality of the construction either from personal knowledge of the farmer's operations or an inspection of his farm. A recommendation for approval or denial together with a statement regarding the real need for some particular piece of equipment or out-of-the-ordinary construction is forwarded to the state committee for its action. Final processing of all cases involving expenditures of over $10,000 is done by the WPB in Washington after review and recommendation by the WFA. In the past cases under $10,000 were processed by the WPB regional offices and recently this authority has been extended to some district offices.

Changes in Order L-41. The WFA is working constantly to improve the farm construction situation. Efforts are made to bring about changes in building restrictions having an undesirable effect on farm production. An equitable distribution of materials and equipment to meet essential needs and assistance in helping farmers obtain these items with as little delay as possible is a primary objective. The elimination of duplication of control over materials and construction is also sought. That these efforts have borne fruit, in spite of material shortages, is evidenced by the more liberal exemptions applying to agricultural construction in the recently amended L-41 order. Under the terms of the amended order, farm dwellings are classified as agricultural construction and as such do not require authorization to build when the cost is less than $1,000 and when new utility connections are not needed. Under the old order the exemption was only $200 for dwellings. The new order authorizes the reconstruction of dwellings costing less than $5,000, destroyed by fire, flood, tornado, etc., without WPB approval or without the necessity of submitting an application. State AAA committees are authorized to approve the reconstruction of farm buildings costing less than $5,000 which are destroyed by fire or other disaster and which are deemed essential to food production.

Authorization is not needed for any project involving only non-reinforced clay or concrete tile in any size. The erection of fencing purchased under PR-19 no longer requires WPB approval since steel has become less critical and since this item is controlled to a certain extent by CMP Regulation 4. Water wells have also been removed from L-41 restrictions because the rationing of pumps limits the number of wells which can be constructed.

Educating the Farmer. Many complaints have been voiced by farmers because of the excessive length of time required for the processing of applications. No doubt a portion of the responsibility rests with those offices handling such cases, but it cannot be denied that if the farmers were better instructed fewer delays would be experienced. An analyst reviewing the case has only the information suppied by the farmer plus the recommendation of county and state committees. It is not enough for the farmer to say that he needs certain facilities although few farm buildings are ordinarily built or equipment purchased unless the farmer feels a distinct need. However, the analyst must know why new construction is essential and why present facilities will not serve for the duration. A description of those facilities and of farm production is a necessary part of the picture in order that a fair judgment can be made of the essentiality of the project. The applicant must show that he is following sound agricultural practices, exactly what the proposed construction is to be used for, and that it bears a definite relation to production on his farm.

Without doubt many deserving cases have been denied because they were improperly supported. A typical example might be cited of a grower who submitted an application for $1500 worth of sprockets, chains, belts, and angle iron for use in a sweet potato storage. The applicant did not state for what purpose the material was to be used, but did say that it was needed in connection with washing

Paper presented at the Fall Meeting of the American Society of Agricultural Engineers at Chicago, Ill., December, 1943. A contribution of the Farm Structures Division.

JOSEPH W. SIMONS is construction engineer, War Food Administration.

and grading equipment and that it was only a small proportion of the equipment required. The WPB analyst had no justification for approving the application, and therefore it was denied. The case was later appealed and approved because the farmer needed to construct a conveyor to carry potatoes from distant bins to washers and graders which he already owned. The main factor justifying approval of the application was the saving of labor in a critical labor area.

No doubt farm educational facilities are now taxed to the limit, but, if it were at all possible, some instruction along the lines just discussed would pay dividends. Such a program could also tell the farmer how to get certain supplies, what materials are the most critical, and what are the best substitutes. Publicity regarding undesirable expansion will save time, money, and materials. For example, the WFA is discouraging any increase in broiler production because insufficient quantities of feed are available. Consequently, few applications for broiler houses are approved. The same is true regarding poultry hatcheries because the total capacity in this country can supply more than the number of chicks which can be fed.

Analysis of L-41 Applications. During the nine months of this year ending September 30, state committees recommended for approval approximately 24,000 applications for farm construction totaling 39⅓ million dollars. These applications of course did not include farm buildings costing less than $1,000 and farm dwellings costing less than $200. An analysis of these cases shows a breakdown into the following types of facilities: houses, 39 per cent; electrical wiring, 15 per cent; barns, 14 per cent; wells, 10 per cent; storage buildings, 5 per cent; poultry houses, 4 per cent; plumbing and heating equipment, 4 per cent; hog houses, 1 per cent; silos, 1 per cent; machine sheds, 1 per cent; miscellaneous, 6 per cent. Fire, tornado, and flood losses, the unusual need for labor housing and the low L-41 exemption on dwellings probably are the major factors influencing the high ratio of houses to other buildings. This ratio will decrease after November 1 because of a change in Order L-41 increasing the exemption on farm dwellings.

Wartime Standardization. Standardization of farm buildings has been the subject of much thought and discussion during the peacetime period preceding the present world conflict. If ever the advantages of such a movement are to be recognized and utilized certainly conditions facing us during this emergency should lend emphasis to the need.

POSSIBILITIES IN FARM BUILDING STANDARDIZATION

The principle of standardization has been utilized to good advantage in two WFA programs dealing with the critical shortage of storage for white and sweet potatoes. In cooperation with the USDA Bureau of Plant Industry, Soils and Agricultural Engineering and with the assistance of selected agricultural engineers, plans and specifications of storages, in a few sizes most often used, were developed and distributed to state and county committees and extension workers. Lumber requirements for the sweet potato storages, for example, are limited to 2½ fbm per bu capacity when locally sawed lumber is specified, or to 1.9 fbm when other lumber is to be used. The saving in lumber can be appreciated when a comparison is made with standard USDA and college plans requiring from 6 to 13 fbm per bu. At the same time nothing was sacrificed in the way of efficiency and improvements were made in several respects.

By agreement with the WPB, applications for potato storages utilizing the standard plans and coming within the material limitations set up are processed promptly because stripping of critical materials has already been accomplished. In the white potato program, negotiations by the WFA resulted in the WPB giving telegraphic approval to begin construction within 48 hours after receiving an application. In a few instances state committees were given authority to grant emergency approval where time did not permit the processing of an application through regular channels.

No doubt this standardization could be applied to other farm buildings with similar beneficial results. It is true that not all buildings lend themselves to this scheme but certainly some simplification could be obtained which would not only benefit the war effort but also have considerable merit in peacetime. However, since zone and area requirements differ, the problem is not too simple and one would hesitate to assume responsibility for such an undertaking unless agreement on the designs could be reached with agricultural engineers representing the various sections of the country. One of the greatest difficulties limiting the success of such a project is the need for adequate fundamental requirements on which to base designs.

The purpose of a standardization program should be not only to conserve critical materials, but also to assure facilities adequate for the uses to which they are to be placed. Inadequate standards are worse than none. An example of this concerns the war housing construction standards established by WPB which did not permit dwelling designs adequate for farm needs. Realizing this, the WFA obtained exceptions to the standards so that a farm dwelling incorporating an area devoted to the processing and handling of agricultural products, the housing or feeding of farm hands, or the supplying of farm utility services need not be limited in area and type of construction, nor require back-to-back plumbing.

Supplemental Lumber Program. Lumber has become a scarce and important item and might be considered as being more critical at the present time from the standpoint of farm construction than either steel or copper. Order M-208, issued August 22, 1942, assigned AA-3 and AA-4 ratings for lumber to be used in the essential construction and maintenance and repair of farm buildings. However, in many areas this was not a sufficiently high rating due to Army and Navy demands. Because of the importance of farm buildings in the production of food the WFA requested and received from the WPB authority to issue, during the third quarter of this year, AA-2 ratings on 500 million board feet of lumber for essential farm uses. Allocations were made to state committees which were in turn redistributed to the counties in proportion to their need.

SUPPLEMENTAL LUMBER PROGRAM IN FULL SWING

This supplemental program did not get into full swing during the third quarter and was therefore extended through the fourth quarter without any increase in the total allocation.. Even this program did not solve the problem as insufficient lumber was available in some sections because of depleted dealer stocks. The seriousness of this depletion can be realized when the production of 34.8 million board feet during 1942 is compared with the consumption of 38 million board feet during the same period. To relieve the situation for farmers, negotiations with the WPB resulted in the issuance of directives which diverted for a certain period an estimated 25 million board feet of Douglas fir lumber per week into farm orders, with precedence established over all orders other than direct military. Also, certain mills producing fir and larch in the western pine region were directed to earmark for agricultural uses, rated AA-2, 75 per cent of their cut produced during August and September excluding ties and timbers. Preference is also being given to requests carrying AA-2 farm and disaster ratings when the dealer's need for special consideration is shown. The results of these directives could not be immediate, but it is believed that the situation has now been eased somewhat. During the four-month period, May through August of this year, 420 million board feet of Douglas fir representing about 35 per cent of the total releases of this species and 163 million board feet or 12 per cent of the western pine released went into agricultural uses.

The Copper Program. At one time during the present conflict copper became so critical that few rural electric line extensions were permitted and only the most essential farm uses were approved. The situation is somewhat easier at present and problems of distribution have been fairly well ironed out.

The Controlled Materials Plan allocates definite quantities to claimant agencies, such as agriculture, in proportion to total production of copper and the established need. Under this program the WFA was authorized to distribute certificates, during the third quarter for almost 2 million pounds of copper for essential farm uses excluding dwellings. These were issued by the county committees in much the same manner as that practiced in the AA-2 supplemental lumber program. At the beginning of the fourth quarter an additional 1½ million pounds was allotted by the WPB and up to November 1 certificates representing over ½ million pounds have been issued. New users are limited to 75 lb and old users to 50 lb. The dealers are able to extend these certificates for stock replacement which is important in any program of this kind. While the wiring of farm buildings is important from the standpoint of food production, there are also many instances in which electrification of the farm dwelling is *(Continued on page 16)*

Building Terraces with the Moldboard Plow

By R. C. Shipman and R. O. Cole

MEMBER A.S.A.E.

THE use of the moldboard plow for building terraces has attracted much attention in Indiana during the past three years. Two important facts have been responsible for the acceptance of the plow method of construction. The first is the development of the drainage type of terrace with the broad water channel and ridge with gentle slopes which offers little interference in the operation of field machinery. The second is the application of a procedure of operations with the plow in the construction process that will move the soil to form the desired type of terrace.

The use of the plow in terrace construction is not new, at least not in Indiana. It was used in combination with the V drag to build the first terraces in the state about twenty-five years ago. The main function of the plow in the earlier methods of construction was to loosen the soil so that it could be more readily moved with other equipment. In the plow method of construction now used the plow serves to accomplish the fundamental job of moving the soil to form the terrace.

The method used most frequently is the "island system" developed by Paul M. Pittinger and others of the U. S. Soil Conservation Service in Illinois. To start this method, the first trip with the plow is made just above the line of stakes which mark the terrace channel grade line, travelling in the direction to turn the furrow slices down the slope. When the far end of the terrace is reached, the stakes are moved down the slope about 10 to 12 ft from the grade line. On the return trip, the furrow slices are turned up the slope to this line of stakes. This leaves what appears to be an island of unplowed land between the turned furrows.

To continue the procedure, using a two-bottom plow, two more rounds are made as in the regular plow operation, which makes a total of six furrows on each side of the island. At the start of the fourth round, the plow is run about 10 to 12 in farther down the slope than it was on the first round, thus replowing the land previously plowed. On the return trip on the lower side, regular plowing is done. Two more rounds with the replowing on the upper side and regular plowing on the lower side gives a total of six furrows moved twice on the upper side and twelve moved once on the lower side. On the seventh round, replowing is started on both the upper and lower sides by running the plow about 10 to 12 in nearer the center of the island. This same replowing process of the three rounds on the upper side and six rounds on the lower side is continued until the plowed land from each side meets on the island. The finished terrace is a series of open furrows made possible by continually rolling the furrow slices toward the terrace ridge.

Another method of building of terraces with the plow was developed by H. F. A. North and Howard Mason in New Jersey. It has been used on a limited number of jobs in Indiana. It uses the principle of replowing, however, the replowing being done only on the upper side. To start, the first furrows are turned down the slope on a line about 10 ft below the grade line. Eight rounds with a two-bottom 14-in plow are turned down the slope before replowing starts. To start the replowing, the first round is made about 12 in farther up the slope than the first. Thus only seven rounds are required to replow completely that which was plowed originally. Replowing is continued making one round less each time until thirty-six rounds in all have been made. This leaves a series of eight open furrows to form the terrace channel.

Paper presented at the Fall Meeting of the American Society of Agricultural Engineers at Chicago, Ill., December 1943. A joint contribution of the Power and Machinery and Soil and Water Divisions.

R. C. SHIPMAN and R. O. COLE are, respectively, extension agricultural engineer and extension soil conservationist, Purdue University.

(Upper left) The plow is run just outside of the stake lines to start the "island". The upper stake line marks the terrace channel. The lower stake line is set about 10 to 12 ft down the slope from the channel line. Shallow plowing is desirable the first time • (Upper right) Replowing is started by running the plow 10 to 12 in nearer the center of the island • (Lower left) The replowing rolls the soil to form the terrace ridge. One more round will complete this terrace • (Lower right) The terrace channel consists of a series of open furrows produced by the replowing operation. (Photos by courtesy of the U. S. Soil Conservation Service)

With both of these systems, the real technique is in the operation of the plow so that it will turn the soil in the replowing operations. The plow needs to be in good condition. Sharp shares are necessary to assist in maintaining an accurate control of depth. In plowing the first time, it is desirable to hold to a relatively shallow depth so that in each replowing operation the depth can be increased and the plow will be working with some unplowed soil. Proper hitch adjustment to avoid side draft in the plow is important. The three-bottom plow is favored from this standpoint; however, the two-bottom plow is the size used on the majority of Indiana farms. Ample power to maintain a relatively fast plow speed assists in throwing soil and helps to keep the moldboard scouring. All extra equipment except rolling coulters should be removed from the plow. Jointers are of no advantage in the replowing and tend to retard the movement of the loose soil through the plow. Heavy growths of surface residues should be removed from the area to be replowed, or should be cut well with the disk before plowing is started.

The construction of terraces with the moldboard plow, leaving a wide, unplowed island during the first round in the plowing process as described, is a relatively new practice in Indiana. Approximately 15,000 rods, or 46 miles, have been constructed in soil conservation districts of the state, using the moldboard plow alone. In addition to this, a considerable amount of terracing has been done with disk plows and by the combined use of the moldboard plow and blade terracer or road grader. Most of the work reported in this paper has been done during the past year.

Terracing has been done with the plow on many of the different soil types in various sections of the state. Among these soil types are Alfred, Princeton, Cincinnati, and Memphis in southwestern Indiana; Gibson, Vigo, Hagerstown, Bedford, and Frederick in south central Indiana; Miami, Crosby, Russell, Carrington, and Kern in central Indiana; and Parr, Fowler, Corwin, and Odell in the prairie section of northwestern Indiana.

EFFECT OF VARYING SOIL CONDITIONS

Soil conditions have varied greatly on the different fields where the plow was used. In fact, terracing has been done when the soil was extremely dry and also when it was extremely wet. Either of these extreme conditions caused difficulty but the dry soils were more difficult to move by this method. Dry soils were more often encountered because the farmers could find time to terrace during the summer after small grains and hay crops were harvested. At this time, the soil was often too dry to do satisfactory work. It is highly desirable that the soil be slightly moist, or in the proper condition for ordinary plowing. Several of the workers in soil conservation districts stated that if the soil is real dry it is better to delay terracing until after a rain, or to use another type of equipment. The disk plow has been used more successfully than the moldboard type when the soil was dry.

This work was done on fields that had been affected by erosion in varying degrees. Where sheet erosion had advanced to the stage that most of the furrow slice was subsoil, difficulties were encountered in scouring when the soil was damp, and with clods when the soil was dry. Again, the disk plow and other types of terracing equipment worked better under these conditions. It is suggested that other equipment be used where gullying has progressed to a noticeable degree.

The amount of terraces built per hour varied greatly due to experience, speed of the tractor, size of the plow, slope and soil conditions. The amount reported was from 50 to 300 ft of terrace per hour. Where conditions are right for the use of the plow method, it is reasonable to expect that 150 to 200 fph may be constructed.

Terraces are usually judged by their cross section. It is always desirable to obtain a wide and deep channel which blends into the upper slope and a wide ridge of sufficient height having gentle slopes. It was possible to obtain, on the average, a ridge 12 to 15 in high after settling. The width of channel varied from 6 to 12 ft with an average of about 10 ft. Most of the ridges had sufficient width and the slopes were gentle enough to accommodate farm machinery.

The principal advantages of this method of construction are that the farmer can use equipment that he is accustomed to operating and which he has on his farm. The rental and moving of larger equipment is saved. All of the construction work can be done by one man, which eliminates the problem of supplying extra labor. When the conditions are favorable and the entire field is to be plowed, this method saves time because a large part of the field is plowed while the terraces are being built. Since this is a more or less familiar operation, and the equipment is available, most of the excuses given for not terracing are overcome. One farmer stated that he would not transport another type of equipment which he had used before, after becoming familiar with the plow method of construction.

It may be said in conclusion that the plow method of construction of terraces is simple and efficient, and gives a satisfactory type of terrace. The moisture condition of the soil should be satisfactory for good plowing. Excess trash should be removed or processed before beginning to build the terrace. Other types of equipment should be used where erosion has progressed to an advanced stage and on slopes that exceed 6 to 8 per cent. The disk plow works better than the moldboard type under dry soil and trash conditions.

REFERENCES

Plow Method of Terrace Construction, Paul M. Pittinger, Regional Bulletin SCS689 CCC644. U.S.D.A. Soil Conservation Service, Milwaukee, Wisconsin.

New Jersey Method of Plowing a Terrace, H. F. A. North and Howard Mason, New Jersey mimeograph.

Terrace Construction by Plowing, Dale E. Springer, AGRICULTURAL ENGINEERING, September 1942.

Building and Maintaining Terraces with Farm Machinery, L. G. Samsel, AGRICULTURAL ENGINEERING, October 1943.

Wartime Building Construction

(Continued from page 14)

justified. If properly substantiated, applications for authority to wire farmhouses are seldom denied.

New power-line connections are controlled effectively by standards based mainly on farm production and essential uses. These restrictions eliminate farms having insufficient production to warrant the use of critical materials or power.

In order to provide copper wire required by the general public for maintenance and repair purposes, the WPB has issued CMP Regulation 9 which allots to dealers quantities up to one-quarter of their 1941 sales. Farmers should be able to secure readily reasonable amounts of wire for repair needs under this regulation.

In conclusion, let me emphasize the fact that the farmer will not be able to improve his buildings and related equipment beyond a practical working limit, nor will a city owner of farms be permitted to build elaborate country show places for the duration. However, you may be assured that the WFA will do all in its power to assist productive farmers in securing materials needed to keep present buildings in good repair, to replace facilities destroyed by fire or other disaster and to provide the new construction necessary for meeting production goals and for preventing spoilage of products.

Farm Building Repair Program

(Continued from page 12)

parable to that of the tractor and implement dealers. That is no alibi to delay action any longer.

J. L. Strahan, in an article in AGRICULTURAL ENGINEERING (August 1943) outlined the possibilities of extension agricultural engineers organizing service schools for dealers and local builders. Perhaps this should be promoted now. It should soon become a regular extension activity.

Extension engineers will undoubtedly organize farm building repair clinics, and the vocational schools will promote regular and out-of-school classes on building maintenance. The farm and urban press, the radio, and other agencies should be employed until everyone, including official Washington and delegates to the United Nations Food Conference, fully realizes the importance of farm structures in producing and conserving food for war.

"Farm building repair" is a *must* program. "Farm building repair" *must* become a household term. "Farm building repair" *must* be translated in terms so the relatives and friends of every person in the armed forces can understand it, and appreciate its meaning.

This is an action program! It is an action program for today. Time is moving fast. Let's get on with this job! Delay may again mean — in terms of food — "too little and too late."

The 1944 Farm Building Goals

By C. L. Hamilton
MEMBER A.S.A.E.

THE 1944 food goals will set an all-time peak for farm production in this country. They exceed those for the banner production years of 1942 and 1943. Achievement will not be easy because the available supply of production facilities, such as labor, tools, and materials, is limited by war needs. Farmers cannot do this job alone, they must have support and encouragement. The War Food Administration has requested the cooperation of other government agencies, of colleges and universities, of industry, and of all others who can help meet the nation's heavy wartime requirements for food, oils, and fibers. For the most effective results all available facilities must be programmed toward this common objective.

American farmers hold the key position in this record production job. If they falter the program fails. They know the nation's needs and they have rallied for the task. They have demonstrated their ability to do the job if they are given the necessary support. During the past year tremendous crops were produced in spite of destructive floods and with scarcities of labor, machinery, feed, fertilizers, building materials, and other essential supplies. To meet the 1944 requirements farmers must plant and harvest about 380 million acres, or 16 million acres more than in 1943. To a greater extent than ever before, this calls for maximum and efficient use of labor, machinery, buildings, and other production equipment.

Determining the amount of farm construction that will be required during 1944 to assure the necessary food production is a difficult problem. With 6 million farms widely scattered throughout the 48 states, and no specific records of farmers' building requirements, no one can predict the exact amount or type of essential 1944 farm construction. Previous construction, farm income, farm building investments, the 1944 food goals, crop yields, wartime construction restrictions and the availability of building materials, transportation, and labor are some of the principal items that will affect farm construction. To analyze the ponderous mass of data on these elusive factors in evaluating their effect on farm construction is confusing enough to discourage any predictions or guesses. In estimating the 1944 farm building requirements it is necessary to adopt a comprehensive viewpoint, review previous trends, and rely largely on field reports to determine the effect of the changed conditions caused by war.

We know that the total amount of 1944 farm construction will be considerably less than the record programs of 1929 and 1941. Construction will not be spectacular, but will be characterized by a variety of comparatively small projects scattered over large areas. There will be millions of small projects scattered over thousands of miles from California to Maine and from the Canadian boundary to the Gulf of Mexico. There will be no uniformity as in defense housing projects, where construction is concentrated and row after row of duplicate houses are built. Under present labor and material conditions, a variety and multiplicity of units will require as much resourcefulness as structural accomplishments distinguished by their technical complexity or grandeur. The very nature of the work makes it difficult to comprehend and to direct. There is little opportunity for regimentation or uniformity of practices. Basic principles must be adapted to local needs and to conditions on individual farms.

The 1944 Farm Building Needs. One of the principal items regulating farm construction requirements is the total investment in farm buildings, which are subject to fairly constant wear and tear from year to year regardless of war or peace. The present value of farm buildings is about 10½ billion dollars, or approximately 3½ times the value of farm machinery and over twice the value of livestock on farms. The annual expenditure required to maintain properly a building plant of this type is about 5 per cent, or around ½ billion dollars depending on price levels. As a result of war conditions it is necessary to make a distinction between desirable and essential repair or replacement. Consequently farmers probably will not be able during 1944 to do much more than 50 per cent of the amount of building repair or replacement that would be desirable in normal times. On this basis an expenditure of about 260 million dollars for maintenance of the present farm building plant can be expected during 1944. From one-third to one-half of this amount will be for essential replacement of fire or tornado losses, and of buildings depreciated beyond repair. This estimate might be increased somewhat by a sudden collapse of the European war or some other major adjustment of this type.

In agriculture there is a general tendency to postpone building repairs and replacements during a depression and to spend during the more prosperous years more than is required for current annual repair or replacement. During the depression years of the thirties, farm building depreciation exceeded expenditures and the number and value of buildings on farms decreased. Farmers did not have enough good years before the war to overcome this deficiency. Since Pearl Harbor war conditions have curtailed all farm construction. It is unfortunate that a great industry like agriculture, involving more than a quarter of our entire population, is unable to maintain fully its physical plant. It must be realized, however, that this is just one of the unavoidable sacrifices incident to war.

In addition to repair and replacement, the 1944 food goals will require some new construction. The principal food increases which farmers have volunteered to produce in 1944 will be in the form of grain, hay, oil, fiber, sugar and vegetable crops, rather than in the form of meat and poultry or dairy products. Consequently a greater need for new farm storages is anticipated than for livestock or poultry buildings. The only increases expected in livestock or poultry products are small increases in milk and egg production, which could be produced by more efficient use of present facilities. Some additional storage facilities may be required for crops like wheat, soybeans, peanuts, potatoes, rice, and dry beans or peas, but the need will not be as great as the food goals would indicate. The disposal of most crop carry-overs before next harvest should release sufficient storage facilities for the principal 1944 needs. At the present time it is not expected that the need for additional storages will be above normal. New storages that may be required will be localized according to crops produced and may be more in the nature of off-farm than on-farm construction.

Attempting to predict the need for various types of farm storages a year in advance is indeed hazardous. After the increased 1944 crop acreages are planted, there are still more unknown factors affecting the need for storage facilities than for any other type of farm construction. For example, a larger acreage increase is being requested for wheat than for any other type of crop, and a storage problem would normally result. To relieve the situation, a much larger than normal amount of storage is expected to be available, because it is estimated that the 1943 crop carry-over may not exceed 300 million bushels, or about one-half of the 1942 carry-over. There are also some 5000 to 6000 unused government bins scattered throughout the grain-producing states that are available if needed.

The dry planting season in the hard winter wheat area has reduced the acreage planted, but a good growing season and high yields in all wheat areas could overtax available facilities, whereas an unfavorable season with low yields would mean surplus storages. On the other hand, a sudden change in theatres of war and concentration of military shipments to the west coast could tie up available transportation or commercial storage facilities to such an extent that some states might have to pile wheat on the ground. The same general uncertainties apply to most of the other crop storage requirements.

Adjustments among individual farms which are not reflected in the national food goals will require more new farm buildings during 1944 than is generally realized. These local adjustments are not desirable from the standpoint of efficient utilization of existing facilities, but their occurrence is common and they cannot be avoided. Even though an appreciable national increase in poultry or livestock is not requested, some farmers with favorable conditions will make large increases in their flocks or herds *(Continued on page 20)*

Paper presented at the Fall Meeting of the American Society of Agricultural Engineers at Chicago, Ill., December 1943. A contribution of the Farm Structures Division.

C. L. HAMILTON is chief, farm construction section, War Food Administration.

Teaching Repair and Maintenance of Farm Buildings in Vocational Agriculture Schools

By K. J. T. Ekblaw
FELLOW A.S.A.E.

SEVERAL things seem to stand out rather prominently to anyone viewing the problem of teaching repair and maintenance of farm buildings in vocational agriculture schools.

1 Apparently little instruction in farm building work of any kind is given in these schools.

2 In most cases, what training is given along this line consists mainly of handicraft work in simple furniture for the household or small items of equipment to use about the farm.

3 The belief prevails among agricultural engineers that engineering subjects should be given greater prominence in curricula designed for training vocational agriculture teachers.

4 The belief prevails among both agricultural engineers and vocational agriculture teachers that the ordinary four-year training course for vocational teachers does not provide opportunity for adequate teacher-training in agricultural engineering subjects.

5 In the opinion of many specialists, vocational agriculture curricula are unbalanced, so far as agricultural engineering subjects are concerned, because they have been prepared largely by agricultural specialists of earlier days when soils, crops, and livestock were of predominant interest and agricultural engineering as a science was undeveloped.

6 Vocational agriculture and agricultural engineering have not always had a common meeting ground, with the result that differences of opinion have developed that have never been reconciled.

7 In most states the vocational agriculture schools have ample and adequate equipment for use in farm building courses. The increased federal funds which have been available in recent years have permitted the investment in good shop equipment, and even in the construction of new and modern shops.

These are some of the things that have impressed me in making a survey of the field and evaluating the situation with the ultimate purpose of making some specific recommendations that would be helpful. Frankly I am somewhat dismayed to find that agricultural engineers and vocational agriculture specialists seem to be so far apart, when as a matter of fact there are no two agricultural groups who have so much in common. The engineering phases of agriculture have always been of vital import to success in farming and are becoming increasingly so. The vocational agriculture teacher who thinks he can teach agriculture without engineering is courting failure in his profession, and the agricultural engineer who lets him think so must share the responsibility. Consequently, the first recommendation that I must conscientiously make is that agricultural engineers and vocational agriculture specialists get together and work out a mutually advantageous solution of their common problems.

The present system of vocational agriculture training is familiar probably to most agricultural engineers. The cap of the organization pyramid is in the U. S. Office of Education at Washington. Regional supervisors correlate the work in various areas. Each state has also its own organization which functions along lines which appear to develop that state's particular interests best. In general, teachers for vocational schools are given training at agricultural colleges in courses specially arranged for them. Presumably in most states there is a rather close relationship between the agricultural college and the vocational agriculture organization.

The teacher training courses given in the agricultural colleges are of course designed to give the prospective teacher a good fundamental knowledge of agriculture, but whether they really do so is a question. The trouble, so far as agricultural engineers are concerned, seems to be that the training courses are deficient in engineering. One of the reasons for this has been mentioned before, but there are undoubtedly other reasons, and possibly some explanation of the deficiency may be found in the attitude of agricultural engineers themselves toward vocational agriculture work. If this be a problem, its solution should be evident.

From what I have been able to ascertain in seeking information on the subject, teachers in vocational agriculture recognize their own deficiencies in engineering knowledge and are anxious to become better informed and qualified. Many of them voluntarily extend their training time by several summers or even by an extra year of college in order to acquire a basis for teaching what engineering may be required of them. With such an indication of willingness to cooperate plainly apparent, it should not be difficult for agricultural engineers to come at least half way and develop a common and mutually beneficial meeting ground. Indeed, this has been accomplished at more than one institution, and the results are in every way commendable.

I do not feel sufficiently well qualified to lay out a complete course of training in farm building construction for vocational agriculture teachers, but I would like to make some general suggestions which I believe can be adopted for their practical value.

First, I believe the assumption that farm buildings are of sufficient importance to justify attention in vocational agriculture schools is correct.

Second, there seems to be general agreement on the point that a good fundamental knowledge of building construction is an asset for practically every farmer. A farmer should be able to build poultry houses, swine houses, garages, machine sheds, and similar buildings himself. He should also know enough about construction in general to enable him to give intelligent supervision to the construction of larger buildings.

Third, enough training should be given to prospective teachers in vocational agriculture to enable them to impart sufficient practical knowledge of building construction to their students. It is believed that a minimum of ten hours per week of theory and practice for 36 weeks should be required.

Fourth, most of the so-called "handicraft" work in shops should be eliminated and replaced with projects directly related to farm building construction. Various useful carpenter tools should be selected and their application described. Practice in their use should be applied to the elements of building construction, such as laying out and leveling foundations, laying sills, setting joists and framing, systems of bracing, the proper use of different kinds of nails, rafter cutting, simple stair construction, how to lay shingles and roofing of various kinds, how to frame and hang windows and doors, etc. Simple calculations for strength of joists, bearing capacities of different types of soil, how to prepare bills of material and how to read simple blue prints, can also well be covered.

Fifth, emphasize the practical nature of the work by extending it to actual construction so far as possible. Often small buildings, such as brooder houses, individual farrowing houses, or range shelters can be built as class projects in the school yard or even in the yard of the local building materials dealer. It is sometimes possible to arrange with some farmer to erect a building at his place; and if the class is large enough, and if the members have become sufficiently skilled, more ambitious projects can be undertaken under such conditions. Of course the matter of responsibility for the safety of students under such conditions must not be forgotten.

If the preceding suggestions are made the basis of the vocational school training, it is certain that good results will be accomplished. The exact procedure to be followed will vary somewhat in different states, but there is no reason for not effecting a reasonable degree of standardization among all state organizations; the fundamentals of construction practice are the same everywhere but of course local applications can be different.

An important fact that faces us today is that we are in imminent danger of a serious shortage of experienced builders in the farm field. A number of factors contribute to this. *(Continued on page 20)*

Paper presented at the fall meeting of the American Society of Agricultural Engineers at Chicago, Ill., December 1943. A contribution of the Farm Structures Division.

K. J. T. EKBLAW is agricultural engineer, American Zinc Institute.

The Iowa Rural Fire Prevention Program

By Henry Giese
FELLOW A.S.A.E.

AS I have the obligation as well as the privilege of representing the American Society of Agricultural Engineers on both of the committees now in session, I wish it were possible to present a picture of the fire prevention effort by agricultural engineers throughout the country. Unfortunately I am unable to do so today and will therefore limit my remarks to my own state with the hope that perhaps in another year the picture can be made more inclusive.

The current rural fire prevention program in Iowa started with the sponsoring of a research fellowship in the Iowa Agricultural Experiment Station on July 1, 1930, by the Iowa Mutual Tornado Insurance Association and the Farmers' Mutual Reinsurance Association. Believing that an Iowa program should be adapted to Iowa conditions, the work began with a careful and detailed study of rural fires reported as required by law to the state fire marshal. Compiling and analyzing these data from year to year continues to be a major activity in the fire prevention program.

From these reports, it became evident quite early that a large portion of the fire waste was caused by a relatively small number of easily preventable causes. Prevention soon became the keynote of the program because not only does one not need to worry about being able to extinguish a fire which is not ignited but also, due to the segregation of Iowa farm buildings from the towns and cities, fire fighting is at once faced with some serious handicaps which must always reduce its comparative effectiveness.

In addition to numerous press and radio releases and convention talks, early publicity included Circular 127, "The Prevention of Wind and Fire Losses to Farm Buildings", and Bulletin 296, "Rural Fire Waste in Iowa 1930-31."

In 1935 an inspection service sponsored by the Farmers' Mutual Reinsurance Association and the Iowa Mutual Tornado Insurance Association was made available to the county mutual insurance associations in Iowa. Inspection effort was concentrated upon the principal causes of Iowa rural fires with particular emphasis upon the repair of defective chimneys and the installation of spark arresters on chimneys extending through combustible roofs in questionable condition. The performance of spark arresters was studied intensively in connection with the research fellowship. A new type arrester was developed and patented. Many thousands of spark arresters have been installed in rural Iowa. The inspection service grew rapidly in extent and coverage until curtailed by the man power shortage incident to the war effort.

A building manual for the appraisal and inspection of rural risks was prepared in an effort to provide underwriters in rural areas with aids comparable to those currently available for urban risks.

Several years ago in cooperation with the Iowa Agricultural Extension Service prizes were offered to 4-H Club boys and girls, Future Farmers of America and other youth organizations making farm fire inspections and doing other fire prevention work. In 1942 in response to a request from the Secretary of Agriculture, fire prevention was given a still more prominent place in extension work. New literature was prepared, county leadership meetings were held, and the effort generally increased. Assistant fire guard buttons were distributed to participators and a suitable window sticker given to cooperators permitting the inspection of their buildings. Prizes were again offered. The results of the year's work are summarized in the following excerpt from a report by Harold H. Beaty who is in charge of the state extension service program:

"Reports on the results of the fire prevention program have been received from 98 counties. (There are 99 counties in Iowa). Seventy of the counties reporting stated that the program had been carried out; 21 counties stated that the program had been started, partly carried out, or not well carried out; 7 reported that the program had not been carried out. A total of 5,097 leaders held 723 meetings with an attendance of 18,543 people. Possibly 85 to 95 per cent of Iowa's farmers were reached by printed circulars, by radio, or by the press. County agricultural extension directors reported reaching directly 73,664 farms and awarding 17,499 fire cooperator stickers and 14,946 assistant fire guard buttons to those participating in the program."

The leaders in the program were listed as follows: 407 firemen, 281 insurance men, 448 members of various county committees, 623 township leaders, 368 home project leaders, 366 4-H Club leaders, 1,821 educational cooperators, and 1,801 others (mostly rural schoolteachers).

The state rural fire prevention committee, comprising members from the Farm Bureau, the National Grange, the Farmers' Union, mutual insurance associations, capital stock insurance companies, grain dealers' association, the superintendent of public instruction, the state fire marshal, and the Iowa State College, met in Ames on August 30 to plan a program for 1943-44. New literature has been prepared and an extensive press and radio program is being carried out. The superintendent of public instruction requested that all rural school teachers give fire prevention instruction during Fire Prevention Week and ask pupils to take fire hazard check sheets home during the week of November 16 to 22 for checking farm and home buildings. Due largely to the pressure of other emergency programs, approach was made to the county extension directors by letter only and no leader meetings are contemplated. Notwithstanding this lack of personal appeal, 44 counties have to date indicated their decision to make fire prevention a definite part of this year's activities.

An additional aid to county effort this year has been the preparation of statistical charts showing the prevalence and causes of fires in each county for the thirteen-year period covered to date in the fire study. At the top a chart compares the yearly losses with one one-hundredth of the state total. Below are listed 30 common causes of fires (including unknown) with the number of fires resulting from each cause in both town and country. The ranking of each cause and the per cent of the total number caused by it are also given. The number of fires rather than the economic waste resulting is used as a yardstick because it was believed that a better comparison from year to year could be obtained in that way. It is felt that these charts will help to bring fire prevention closer home because the people in each county can base their program on their own local problem.

It would be most desirable if this report could be concluded with conclusive evidence of a great reduction in rural fire waste as a direct result of the efforts put forth. Obviously, however, the results are negative and not positive, and hence it is dangerous to take too much for granted. Just because a set of buildings which was carefully inspected did not burn is not conclusive evidence that they would have burned had the inspection not been made.

On the other hand, I would like to call your attention to a number of existing situations in the hope that perhaps you may arrive at somewhat the same conclusions that some of the rest of us have. We know that as a result of inspections made by trained persons in the service mentioned above, as well as those made by school children, thousands of hazards have been identified and corrected. We know also that when inspections are made again after a five-year period most of those corrected previously are not permitted to recur. On November 24, the Farmers' Mutual Reinsurance Association advertised in a special insurance and financial edition of the Des Moines Tribune that losses per thousand at risk in 115 Iowa county mutuals dropped 42 per cent from 1936 to 1942.

During 1930, a total of 6,987 fires were reported to the Iowa state fire marshal. Of these, 4,321 occurred in cities and 2,666 in rural areas. By 1942 the total number had dropped to 3,866, a reduction of 44½ per cent. This reduction, however satisfactory and desirable it may be, did not occur uniformly over the state. Urban fires dropped from 4,321 in 1930 to 2,915 in 1942 (37½ per cent), while rural fires were reduced from 2,666 to only 951 (64.4 per cent). We know that energetic fire prevention efforts have been

A report to the Farm Fire Protection Committee of the National Fire Protection Association and the Agricultural Committee of the National Fire Waste Council, on behalf of the American Society of Agricultural Engineers, presented at Chicago, Ill., November 29, 1943.

HENRY GIESE is professor of agricultural engineering, Iowa State College, and is the official representative of the A.S.A.E. to the N.F.P.A. and the N.F.W.C.

made in the cities of Iowa and have no desire to detract from the credit due for a reduction of 44.5 per cent in the number of fires during the 13-year period. On the other hand, may we raise the question as to the cause of the much greater reduction in the rural areas and particularly the consistent downward trend during the past four years (1,814, 1,449, 1,237, and 951). While it may be too much even to hope that the downward trend can be maintained without any reverses, it would appear that the record for 1943 is at least almost as good as that made in 1942.

The 1944 Farm Building Goals

(Continued from page 17)

while others decrease or even dispose of their livestock because of feed, labor, or financial problems. New farms are being started and old ones abandoned or consolidated. This leads to one farmer requiring additional building facilities while others may not be utilizing fully their existing buildings, yet the total food production remains unchanged.

In addition to livestock buildings and grain or vegetable storages to provide for adjustments of this type, some new housing facilities will be required by adjustment to new labor problems. Farm laborers generally have been the most poorly housed of all farm people and single laborers are being replaced by families or other types of help. To retain essential labor, many farmers may either have to remodel present housing facilities or construct new ones.

Considering the most essential repair, replacement, and other new construction, the total amount of farm construction during 1944 could easily amount to about 400 million dollars. It appears that about two-thirds of this amount will be for repair and replacement of existing facilities and about one-third will be additional construction for increased food production or local farming adjustments. The distribution of all farm construction will be largely in proportion to the value of farm buildings with some minor adjustments for increased production in local areas. This indicates that about 50 per cent of all 1944 farm construction will be in the north central states. About 15 per cent will be in the northeastern states, 10 per cent in the western states, and 25 per cent in the east central and southern states. In the past from two-thirds to three-quarters of all farm construction has occurred during the second and third quarters of each year. The remainder was divided between the first and fourth quarters.

While food production in 1944 will be at a record high, the total volume of farm construction will probably not exceed more than about one-half of the amount constructed in 1929 or 1941, or of what might be expected with good crops and prices and normal building conditions. With higher price levels for labor and materials, the amount of construction in comparison to expenditures will be less than during normal times.

The 1944 Building Campaign. Many of the building material representatives from industry may feel that these estimates are low. They do not represent all desirable farm construction. They represent only the minimum essential to the food production program or the maximum feasible under present conditions. Labor and building material supply problems will be the principal limiting factors. Of all building materials lumber will be the most critical. While an effort will be made to divert all possible materials to farm construction, the competition for scarce materials among essential uses has become keen, and there is little hope of increasing production. To obtain the most essential construction an effort must be made to use critical materials sparingly and to use substitutes and salvaged or locally produced materials wherever possible.

Since maximum conversion and maintenance of existing facilities will reduce the need for new construction and represent a more efficient use of critical materials and labor, the 1944 farm building campaign should be directed to this phase of farm construction. In securing the most efficient use of available materials, farmers must be instructed how to use non-critical materials effectively. It is also important that they anticipate their needs in advance, because there will be delays in the procurement of materials. Lumber dealers' inventories, in particular, are badly depleted, and deliveries from mills will not only be difficult to secure, but may require several months. With the present lumber shortages, appreciable restocking of dealer inventories is practically impossible, even though the desirability is unquestionable.

Except for essential replacement, new construction should be considered only as the last resort. While this is not the way we would prefer it to be, it is again one of those unavoidable war sacrifices which all of us are called upon to make. All possible new construction must be deferred for the duration. It is realized that this is a discouraging policy for a group of men interested in better farm buildings. Many individual adjustments will have to be made. We must keep our farm building program in tune with needs. For example, it would not seem appropriate to advertise or promote the sale of new broiler houses when a decrease in production is advisable and when the limited construction materials should be directed to more essential farm construction. As much, if not greater, resourcefulness and skill will be required to develop and guide this vital wartime program as would be required for a program of new construction.

Teaching Repair and Maintenance of Farm Buildings in Vocational Agriculture Schools

(Continued from page 18)

Urban construction has taken many rural builders who are tempted by higher wages than farmers can afford to pay. In the last twenty or thirty years very few young builders have been trained in the farm field. Farm buildings, as every one is aware, have been steadily deteriorating for many years, and a huge program of rehabilitation will soon have to be undertaken. That is when this shortage of competent building help will be very keenly felt, and it may possibly be disastrous if some steps are not taken to eliminate the impending danger.

The inclusion in vocational agriculture curricula of adequate training in building construction will do much to help the situation. If several thousand boys can be taught the elements of building construction; if they can learn to build the smaller or simpler type buildings that are needed on every farm; if they can learn to differentiate between good and bad construction, so that they can obtain satisfactory results in supervising the construction of larger and more elaborate buildings, the net result to agriculture in general will be of tremendous value.

Because vocational agriculture schools appear to offer, at this time, the most practical solution to the impending shortage of builders in the farm field, it is well to give the matter serious consideration. Not only that, we should have immediate action; for it is apparent that we must have an immediate solution to another serious problem facing farmers right now, that of keeping their buildings in a good state of repair for the duration of the war. All of you know, of course, that farm building repair has been incorporated into the War Food Administration's production campaign as one of its important phases, and the sooner we are in a position to give farmers intelligent and worth-while aid in his repair problems the better it will be. Many farmers by necessity have had to teach themselves to be builders, and the result has not always been good; if they could only have had even a moderate amount of practical instruction at the beginning it would in most cases have been of very great value to them.

It seems to me that this whole problem resolves itself into two parts: First, the training of competent teachers and supervisors and, second, providing the instruction in classroom and shop that will make reasonably good builders of the students.

The solution of the first problem should not be difficult. With the vocational agriculture organization now existing, the agricultural engineering department and the vocational teacher training department should meet with the state director of vocational agriculture, under the sponsorship of the regional supervisor, to lay out such teacher training courses in agricultural engineering as may be necessary to accomplish the desired result.

With properly trained teachers available, it will be a simple matter to find the answer to the second part of the problem.

From the very keen interest evinced by a number of agricultural engineers and vocational agriculture teachers, whom I have consulted about this matter, I judge that the time is ripe for a very serious discussion of this whole problem. The enrollment in vocational schools is steadily increasing, as is also the importance of engineering in agriculture and the demand for practical agricultural engineering training. The situation with regard to farm building repair and rehabilitation is serious. Someone must take the initiative; the agricultural engineer should be the one to take it.

"... and I often think of Elm Street"

"... I'm a long way from home out here, and when I'm alone at night, Dad, I often think of Elm Street with its big trees, its neat houses, the bells on a quiet Sunday morning—and all of us coming in town for church. It's the peace and freedom and decency of it all that gets under my skin—and it makes me a bit homesick now and then.

"There's nothing like Elm Street over here—and never will be till they change their system.

"The trouble lies with the men who rule—and with the people who let them get away with it.

"Over here the wrong men have been running things too long. They have been crazy with power. They gradually took over more and more, and when the people finally woke up—it was too late. These folks can't throw out their officials the way we can. They have to have a war to get rid of their so-called 'new order.'

"Thank God we can still put the men we want into office—and throw them out again—with ballots instead of bullets.

"This mess is a fine example of what dictatorship and regimentation can do when they really get going. And talk about bureaucrats—you ought to see what the ones over here are doing to farmers. You can't do anything on your own. You just take orders—and like it.

"We ordinary folks at home always had a feeling of independence and self respect. You and Mom were always looking ahead to *better* things—for yourselves and for us kids. That sort of thing is missing here, Dad—and I think it's the result of years of being pushed around. These folks have been told what to do and when and how to do it for so long that they don't know anything else. They've forgotten how to think for themselves.

"Don't let this system get a toe hold at home, Dad. It's bad stuff. And the trouble is, it sneaks up on you. You don't realize that it's got you till it's almost too late.

"I think most American farmers are just like us—plain, practical, hard working, thrifty people—blessed with a lot of good common sense. Most of us aren't very strong for fancy political theories. We know by experience that the American way of getting things done, even with its short-comings, has brought more real happiness, prosperity, progress, education, health and general good to more people than any other system in the world.

"And that's something to think about..."

★ ★ ★

Millions of American boys from farms and villages are doing a lot of thinking. They are writing home anxiously these days. Many of them are worried—wondering what is happening to America while they are away. They realize now, more than ever, what real freedom means—and we at home must guard it for them as well as for ourselves.

BUY WAR BONDS AND STAMPS

REPUBLIC STEEL

GENERAL OFFICES: CLEVELAND 1, OHIO

Export Department: Chrysler Building, New York 17, New York

WOVEN WIRE FENCING • BARBED WIRE • STEEL FENCE POSTS • BALE TIES
ROOFING and SIDING • NAILS • STAPLES • BOLTS, NUTS and RIVETS • PIPE
CARBON, ALLOY and STAINLESS STEELS for FARM and DAIRY EQUIPMENT

A Fire Prevention Program

By John R. Haswell
FELLOW A.S.A.E.

WHAT we may call a "Program" is primarily based on a need for the kind of information requested by the farmers of Pennsylvania through the county agricultural agents and the state agricultural extension service. To fill such requests we use the federal publications and the report entitled "Farm Fire Prevention and Control" as published by the American Society of Agricultural Engineers. This material is comprehended in the old formula of the federal extension service, i.e., W.S.A.S., the letters referring to "Want", "Solution," "Action," and "Satisfaction."

Want began with a number of requests for real authentic information on correct lightning rods. This was brought to a climax when W. H. McCullough of Underwriters' Laboratories spoke before the 1934 A.S.A.E. North Atlantic Section meeting.

When hay chopping began to be commonly practiced, a number of fires resulted, and we were directed to cooperate with the USDA Bureau of Chemistry. We filled out a number of questionnaires on the various cases of hot hay fires.

Solution. Prevention is more important than protection or fighting. The prevention of farm fires must be aimed at the causes, which can be determined only by discovering the facts about farm fires. These facts form the basis of prevention programs. Statistics are worthless unless they are used. To conduct a survey, publish the resulting figures as a matter of interest, and then file them away is sheer waste. The results must be analyzed, studied, and *used*. We used the results of Henry Giese's study in Iowa published in AGRICULTURAL ENGINEERING, April 1942, with slight changes for our local conditions. He reports: "The action programs developing from the study consist primarily of inspection work carried on by the mutuals of Iowa and by farm youth organizations such as 4-H Clubs and Future Farmers of America." Our work has naturally been with the 4-H Club members because you cannot change adults to any great degree. Work with Future Farmers comes under the state department of public instruction an the teaching and research departmentsc at the College. V. S. Peterson, while assistant professor of agricultural engineering extension, developed an inspection blank and directions for making inspections which has wide use.

The mimeograph which we have for distribution gives a rough outline of the main points we attempt to cover. Mr. Giese's figures show that in Iowa 93 per cent of the losses occur in dwellings and barns. In dwellings the two major causes are defective flues and sparks on roofs, totaling 75 per cent. The nearest approach of any of the other causes is only one-fourth of either of these two causes. In barns the major losses are from spontaneous ignition of hay and lightning on unrodded buildings, which total 71 per cent. If these four major causes on the two main buildings are effectively covered, there is little need for paying much attention to the other twenty-eight items which are listed.

Action. We have been asked to speak at county agent meetings and have made a number of suggestions. During farm visits we have assisted in laying out farm ponds for fire protection. The state association of mutual fire insurance companies has had their annual meeting at State College where we covered lightning rods. The little static demonstration machine always excites interest and gets the farmers to thinking. Some insurance representatives have even gone so far as to have meetings in their homes in order to get their patrons to be more careful. Several demonstrations of Michigan methods of fire fighting with an orchard spray gun created interest in the possible use of our 1400 power sprayers as farm fire engines. (Pictures were shown.)

Many of the members of our 1800 volunteer fire companies attend the annual state fire school held at State College. We have sat in on the sessions and discussed the farmers' problems. That these organizations are far more than social clubs is well brought out in the "Country Gentleman" for October 1942.

The state council for defense and the state department of forests and waters also know of the educational layout. We have worked with the former primarily on the incendiary bomb hazard possibility and the latter with their offer of assistance to the farmers from their 3900 volunteer forest fire wardens.

Satisfaction. We have had new barns rebuilt in locations where the old ones have been burned by lightning. The layout of the rods was suggested by the extension service, and the barns are still standing after a number of years. In one locality where the winter activities of the Happy Valley Pig Club was farm fire prevention a case of hot hay was encountered and the barn saved because the local leader knew what to do. A county agent was told by several of his farmers that a warning he put in the newspapers relative to the same subject saved their barns.

One mutual fire insurance company will not cover any farm properties not protected by lightning rods, and at least one other gives a reduction in premium on rodded properties.

A study by our department of agricultural economics on rural housing in Pennsylvania showed very few glaring fire hazards as one of the many items taken up.

We have had two suggestions which failed to bring anticipated results. One was a spark arrester, particularly for use where there were shingle roofs, and practically all of our cooperators now have fire-resistant roofing. The other was the hay-mowing chute.

The question of farm fires, both from the standpoint of prevention and protection, has been turned over in most cases to the agricultural engineers. We recommend the assistance of agronomists, chemists, foresters, etc. Their cooperation is always appreciated, and the only way we have been able to get a thorough understanding of the problems is always to have the farmers fire conscious, and to accomplish this requires a lot of help.

Paper presented at a meeting of the North Atlantic Section of the American Society of Agricultural Engineers at New York, N. Y., October, 1943.

JOHN R. HASWELL is professor in charge of agricultural engineering extension, Pennsylvania State College.

Student Branch News

GEORGIA

Mack Powell, *Scribe*

OUR Student Branch with a membership of sixteen students registered with the Secretary of the A.S.A.E. the early part of this past October. We have had five most enjoyable and instructive meetings and one social during the quarter.

At our first meeting the four department staff members gave short talks that proved helpful to us both in our college work and Branch activities. We have decided to publish our annual, the "Georgia Ag Engineer", and plan to have it off the press early in January 1944.

Two of our programs consisted largely of moving pictures. Electricity at work on the farm, the training of paratroopers, and wartime agriculture were the themes of those shown one evening. At another meeting "Soldiers of the Soil", presented by Du Pont, was shown. This is one of the most forceful pictures of its kind I have ever seen. In a most dramatic manner a blind Marine, home from the Pacific war front, tells the people of his community how the farmer is helping to win this war.

We had a joint meeting with the Agricultural and Poultry Science Clubs on November 23. Dr. Paul W. Chapman, dean of the college of agriculture, told us how the war had affected our enrollment and how educational training was making it possible for students to render a greater service. This joint meeting proved so successful that on December 1 we met with the Agronomy and Forestry Clubs to hear J. R. Carreker, assistant superintendent of the SCS Southern Piedmont Experiment Station. He gave us a most valuable and instructive talk on the soil conservation work being carried on at that station.

Our social activities seem to have been well taken care of during the quarter. Refreshments were served at three of the meetings, and on November 19 we had a hayride and chicken dinner to which dates were invited.

Our president, Ed Pullen, and several others are graduating (they hope) at the end of this quarter. To them and others who do not return next quarter we wish the best of luck. Officers elected for the winter quarter are H. L. Pittard, president; W. H. Callaway, vice-president; J. C. Denton, secretary; H. W. Glover, scribe.

NEWS SECTION

Nominations for 1944-45 A.S.A.E. Officers

THE Nominating Committee of the American Society of Agricultural Engineers, consisting of A. W. Clyde (chairman), J. D. Long, and S. P. Lyle, have placed in nomination the following members of the Society for the various offices to be filled at the next annual election of officers:

For President

R. H. DRIFTMIER, head, agricultural engineering department, University of Georgia

For Councilor

F. E. PRICE, research agricultural engineer, Oregon State College

IVAN D. WOOD, district engineer, Farm Security Administration, U. S. Department of Agriculture

For Councilor

F. H. HAMLIN, vice-president, Papec Machine Co.

D. A. MILLIGAN, director of research, Harry Ferguson, Inc.

For Nominating Committee

H. J. BARRE, head, agricultural engineering department, Purdue University

RAY CROW, engineer, sales promotion division, Tennessee Coal, Iron, and Railroad Co.

J. P. FAIRBANK, extension agricultural engineer, University of California

C. N. HINKLE, tractor representative, sales technical service department, Standard Oil Co. (Indiana)

M. H. LLOYD, rural service engineer, Niagara, Lockport and Ontario Power Co.

HOWARD MATSON, chief, engineering division (Region 4), Soil Conservation Service, U. S. Department of Agriculture

The by-laws of the Society provide that by March 1 of each year the Secretary of the Society shall mail each member entitled to a vote a ballot stating names of the candidates for elective office to be filled at the next election.

A.S.A.E. Southeast Section Meeting

THE Southeast Section of the American Society of Agricultural Engineers will hold a two-day meeting at the Henry Grady Hotel, Atlanta, Georgia, February 1 and 2. To all agricultural engineers and others interested in the program to be presented, the officers of the Section extend a cordial invitation to attend this meeting.

The Section chairman, Walter N. Danner, Jr., will preside at the opening session of Tuesday forenoon, February 1. The program will open with a talk by S. P. Lyle of the USDA Extension Service on the logistics of wartime food production, followed by J. W. Simons, WFA construction engineer, on wartime problems in farm building construction. Other speakers at this session include Ray Crow, of the T. C. I. & R. R. Co., on efficient structures for livestock and crop storages; R. M. Merrill, WFA farm machinery and supplies division, on government policies on farm equipment and supplies, and C. E. Seitz, head of ag engineering, Virginia Polytechnic Institute, on hay harvesting and curing equipment in relation to the feed shortage.

At the second session of the meeting on Tuesday afternoon, February 1, the Section vice-chairman, Geo. B. Nutt, will preside. The program of the session will be opened with an address by Arthur W. Turner, president of the American Society of Agricultural Engineers, on the agricultural engineer in the postwar period. Five other talks are scheduled for this session — by Frank J. Zink, research engineer of the Farm Equipment Institute, on new developments in farm machinery, by I. F. Reed, associate agricultural engineer of the USDA Farm Tillage Machinery Laboratory, on peanut harvesting equipment, by T. S. Forrest, a farm equipment dealer at Tunica, Miss., on farm machinery and machinery dealers in the war effort, and by Paul M. Mulliken, executive secretary, National Retail Farm Equipment Association, on the advantages of organization for farm equipment dealers of the Southeast.

G. E. Henderson, secretary of the Section, will preside at the forenoon session on Wednesday, February 2. The five numbers on the program for this session include talks by Harry L. Brown of the Farm Credit Administration on agricultural engineering and its place in the Southeast agricultural development, by Raymond Olney, secretary of A.S.A.E., on agricultural engineers on the home front, by J. P. Pope, one of the directors of the Tennessee Valley Authority, on rural electricity tomorrow, by C. W. DuBois, head of the food preservation department of Louisiana State University, on home-size zero-degree storage cabinets, and by H. D. White of the University of Georgia on home and community dehydration, with a discussion by G. E. Zerfoss, assistant agricultural engineer, TVA.

Section Chairman Danner will preside at the closing session of the meeting on Wednesday afternoon, February 2, at which the following speakers are scheduled: J. A. Stevenson, agricultural engineer, AAA on the use of purchase orders for constructing terraces under the AAA program; by John R. Carreker, associate agricultural engineer of the SCS Southern Piedmont Experiment Station, on construction and management of farm ponds for livestock watering, fish propagation, and irrigation; by George Peterson of the Tennessee Agricultural Experiment Station on development of an aqua ammonia distributor; by Fred W. Knipe, malaria control engineer of the Florida State Board of Health, on the cooperation of agricultural engineering with malaria control planning in the Southeast; and by Tom Fullilove of the Georgia Agricultural Experiment Station on farm labor shortages and their effect on farm management practices.

The meeting will be brought to a close with a short business session of the Section.

A.S.A.E. Meetings Calendar

February 1 and 2 — Southeast Section, Henry Grady Hotel, Atlanta, Georgia.

June 19 to 21 — Annual Meeting, Hotel Schroeder, Milwaukee, Wis.

The 1944 Farm Machinery Outlook

A FEATURE of particular interest to those attending the Fall Meeting of the American Society of Agricultural Engineers at Chicago last month was the report by George Krieger, director, farm machinery and equipment division, War Production Board, on the outlook for the farm machinery program for 1944. We are indebted to Elmer J. Baker, Jr., editor of "Farm Implement News", for the following report of Mr. Krieger's remarks which appeared in the December 23rd issue of that publication substantially as follows:

Mr. Krieger stated that there will be materials and component parts available to build the farm equipment authorized by WPB Order L-257 and L-257a. It seems that some manufacturers had intimated that all they had received was a "hunting license" for the materials, that they were not getting them, and that farmers were being deluded by expectations of getting quantities of whole goods called for under the order. The blame for this situation has been laid to the AA-2 priority rating, the makers of tractors and implements claiming that only an AA-1 rating would get the goods.

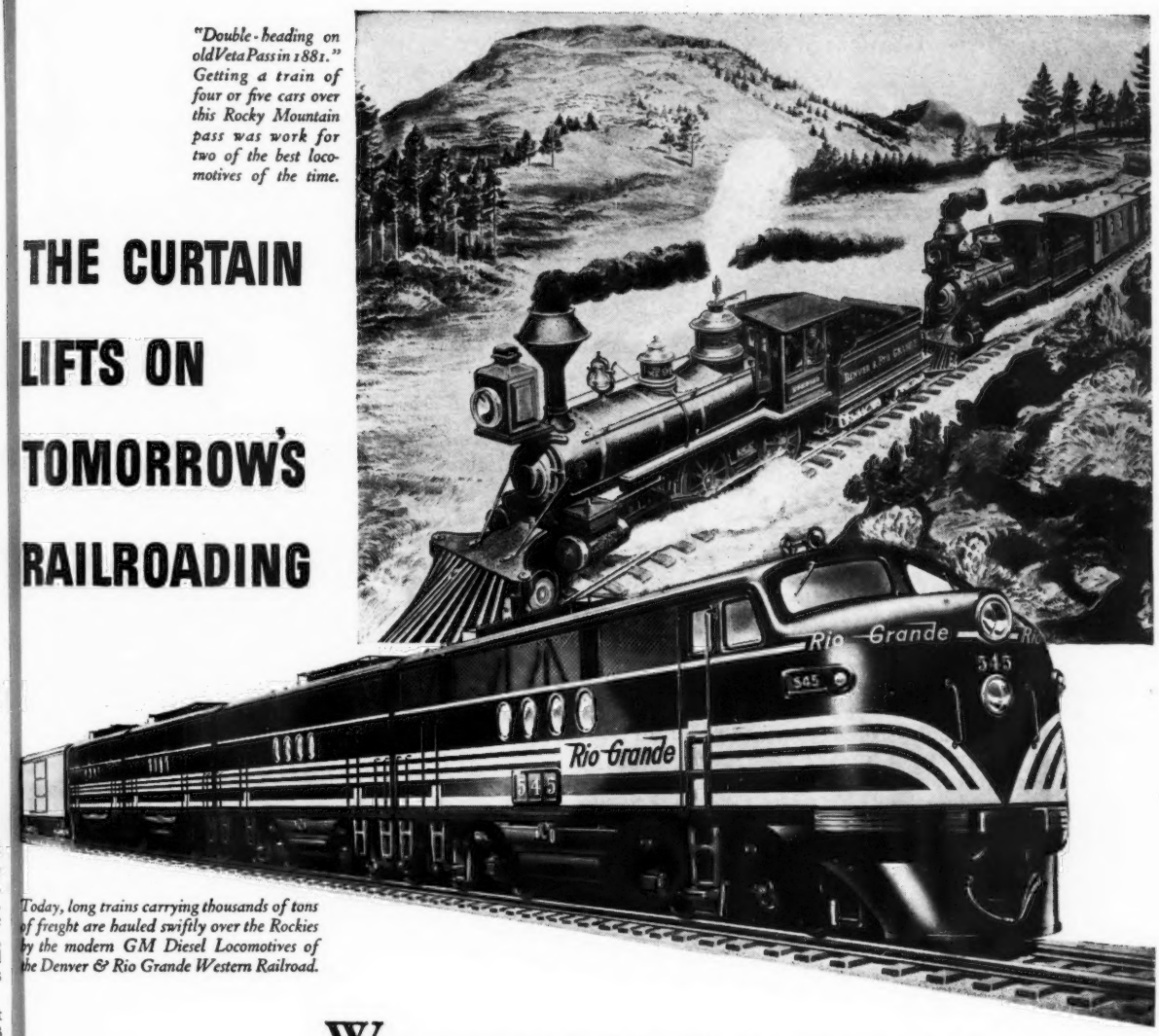
The farm equipment industry has been allotted, said Mr. Krieger, 974,000 tons of steel and other critical material, which it is getting in three quarters instead of being spread over the entire year. An AA-1 rating would do no more because under CMP allocations the steel is earmarked without regard to ratings. As for component parts, which are class B products and come under ratings such as bearings, tractor engines parts, and similar fabricated items, whenever any bottleneck has appeared and WPB has been apprised of the situation, steps have been taken to expedite the shipment of materials with emergency ratings as high as AA-1 if necessary to get the parts at the receiving platform of the tractor plant.

Malleables have been a problem, it was admitted by Mr. Krieger, but this situation is due not to priorities but to labor shortages in the malleable foundries. Few of these foundries have been able to operate as much as 70 per cent of capacity, and it takes more than a WPB directive to offset a labor shortage. But the problem is being studied and a solution sought by those who can do something about it.

To expedite shipments which are holding up farm equipment production under Order L-257 and help manufacturers fill out their CMP and other forms, the WPB has established a field organization, the help of which is available on call by any manufacturer of farm equipment. Names and addresses of these field representatives are available on request to WPB. *(Continued on page 26)*

"Double-heading on old Veta Pass in 1881." Getting a train of four or five cars over this Rocky Mountain pass was work for two of the best locomotives of the time.

THE CURTAIN LIFTS ON TOMORROW'S RAILROADING



Today, long trains carrying thousands of tons of freight are hauled swiftly over the Rockies by the modern GM Diesel Locomotives of the Denver & Rio Grande Western Railroad.

WHEN you think of the Diesel locomotive, don't picture only the sleek, streamlined passenger trains which shorten distance and race the clock. Think too of the mainline Diesel freight locomotives which General Motors builds. These swift, dependable giants of power are contributing heavily to the astonishing war record of the railroads. They are raising the curtain on new standards of transportation keyed to the era which lies ahead.

GM
GENERAL MOTORS
DIESEL POWER

LOCOMOTIVES ..... *ELECTRO-MOTIVE DIVISION, La Grange, Ill.*

ENGINES....150 to 2000 H.P. *CLEVELAND DIESEL ENGINE DIVISION, Cleveland, Ohio*

ENGINES.....15 to 250 H.P. *DETROIT DIESEL ENGINE DIVISION, Detroit, Mich.*

One explanation was offered by Mr. Krieger as to why there had been such a shortage of some component parts such as disks. The WPB discovered that some enterprising producers had ordered their year's supply from one company and then had also ordered 50 per cent of their year's requirements from each of two other companies. To explain why the demand for critical materials is still so great, Mr. Krieger pointed out that war production required about 44 million tons of steel in 1943, but that the requirements for 1944 will be 61 million tons. He also gave some arresting figures on the number of landing craft required in the next year, which have been since confirmed in Washington statements.

In the first three months of the production year under Order L-257, Mr. Krieger stated that some producers were behind schedule, but that production is now being accelerated and that at a meeting on November 5 all companies represented expected to meet production schedules. Some companies have had their quotas increased, Mr. Krieger said, but no quotas, despite some rumors, have been taken away. The War Food Administration, he also pointed, is not interested in the farm equipment competitive situation — in other words, maintaining volume by companies in accord with the historical record. The steel now allocated is 96 per cent of the industry's biggest year, and the entire year's tonnage has been released. The job now is one of production, expediting, and bottlenecks. Quotas probably will be unfrozen sometime in the future and CMP procedure dropped entirely.

Necrology

WALTER GILLING WARD, in charge of agricultural engineering extension, Kansas State College, passed away at his home in Manhattan, Kansas, on November 22.

Mr. Ward was born at Galva, Iowa, March 28, 1887, and early in life chose engineering as his professional field, specializing in architecture. He graduated from Kansas State College in 1912.

For two years following graduation, 1912 to 1914, he was an instructor at Michigan State College, and for the next six years, 1914 to 1920, he was in charge of the architecture department of the North Dakota Agricultural College.

He returned to his alma mater to become extension architect in 1920, which position he held until 1925. Having displayed his abilities in organization, leadership, and knowledge of his professional field, he was selected to become head of the department of engineering extension in 1925, the position which he held at the time of his passing.

Throughout his professional career Mr. Ward believed in self-improvement to better fit himself to be of service to the peoples whom he served. In 1930 he was granted leave from Kansas State College to pursue advanced study at Iowa State College, where he received the degree of master of science in architecture in 1931. Professionally he was nationally known through his association as a member, with the American Society of Agricultural Engineers and the American Institute of Architects. He was a registered professional engineer in the state of Kansas; a member of the Kansas Society of Architects; a member of Gamma Sigma Delta, honor society of agriculture; Sigma Tau, honorary engineering fraternity; Phi Kappa Phi; and Epsilon Sigma Phi, national honorary extension service fraternity.

He is survived by his wife and daughter, Miss Wilma Ward, at home, and two sons who are carrying on the sterling qualities of his family in the armed services, Lieut. Arlin Ward, U. S. Army Air Force, and Lieut. Leland Ward, U. S. Navy, now somewhere in the Northwest Pacific.

His associates pay him this tribute: In life he constructed foundations on which to build the security of family life, community, state, and national enterprise, and in passing he leaves a pattern of truth, faith, courage, and determination as a guide for others to follow.

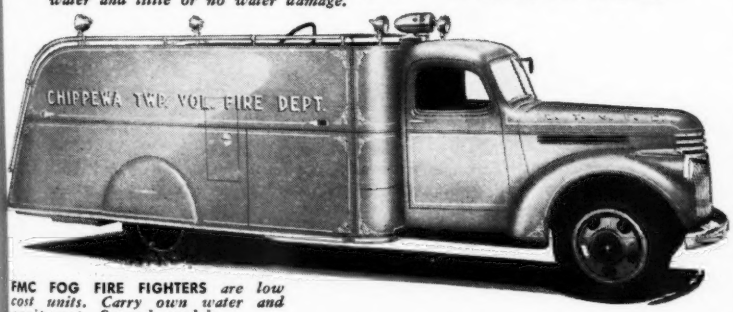
ARTHUR F. WILT, acting manager, agricultural division, technical service department, Ethyl Corporation, passed away December 9 at Detroit, Michigan, after an illness of approximately three months.

Mr. Wilt was born October 2, 1903, in Kent, Ohio, but moved soon afterward to Florida where he resided until the passing of his parents. He graduated in 1926 from the Georgia School of Technology with a bachelor of science degree in mechanical engineering and then became associated with the engineering division of the New Mexico state highway department.

Three years later he joined the Ethyl Corporation and was assigned to the Southwest division. Later, when this division moved its headquarters to Tulsa to become the Tulsa division, Mr. Wilt went along. For three years he was active in the introduction of Ethyl gasoline to new licensees in that division and in the planning and supervision of blending installations. His next move was to corporation's Chicago division, where he was given a similar assignment. Here, in addition to his regular *(Continued on page 30)*

800 LB. PUMP PRESSURE SECRET OF FIRE-KILLING FOG!

FMC FOG FIRE FIGHTER *puts out fires up to 35 times faster, with 90% less water and little or no water damage.*



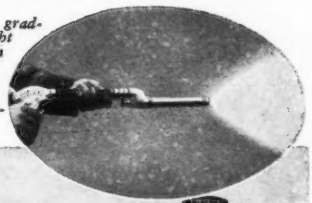
FMC FOG FIRE FIGHTERS *are low cost units. Carry own water and equipment. Several models.*

Only FMC Packs the Punch that Delivers 600 lbs. at Nozzle

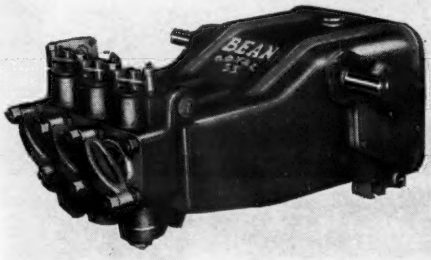
Why 800 lb. *pump* pressure for fog fire fighting? Because it takes 600-700 lb. *nozzle* pressure to deliver the superfine fog and its quick-quenching efficiency with a minimum of water. Deduct 100 or 200 lbs. from any 300, 400 or 500 lb. pump pressure, and you cannot get the 600 lb. *nozzle* pressure that is exclusive with FMC high-pressure fire fighting equipment.

Friction loss in 250 feet of high-pressure hose is great and many fires cannot be reached with less than 250 feet. If your pressure is not high enough to start with, your *nozzle* pressure can't be more than 100 to 300 lbs. with little or no high-pressure benefits.

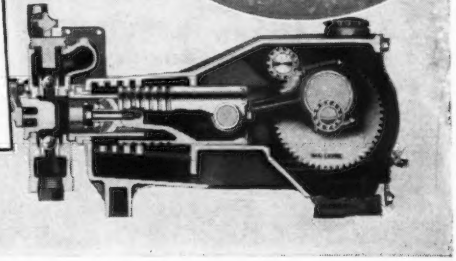
Don't confuse FMC High-Pressure Fog with any other system. Nothing compares with it for speed, efficiency and economy of water for all types of fires. Get full details from John Bean Mfg. Co., Lansing, Mich., or Bean-Cutler Division, Food Machinery Corporation, San Jose, Calif.



FOG FIRE GUN *graduates from straight "power" stream to close-up fog. Efficient for use only with 600 lb. nozzle pressure or more!*



THE PUMP THAT IS REVOLUTIONIZING FIRE-FIGHTING TECHNIQUE



THE PUMP *that is revolutionizing fire-fighting technique. The "heart" of the FMC Fog Fire Fighter. Pumps 60 gallons of water a minute. Built for much higher pressure, it easily gives (800 lb. pump pressure) 600 lb. nozzle pressure without overworking.*

FMC *Original* **HIGH-PRESSURE FOG FIRE FIGHTER**

FOOD MACHINERY CORPORATION

JOHN BEAN MFG. CO., 700 HAZEL ST., LANSING 4, MICH. • BEAN-CUTLER DIVISION, 400 JULIAN ST., SAN JOSE, CALIF.

BUILDERS OF BEAN HIGH-PRESSURE PUMPS FOR OVER 50 YEARS

activities he assisted in the field experimental work being constructed on high compression engines for farm tractors by George Krieger.

In 1936 Mr. Wilt was transferred to the technical sales division in Detroit, where until his passing he devoted full time to establishing the high-compression program for farm tractors. In 1942, when Mr. Krieger was called to Washington by the farm machinery division of the War Production Board of which he later became director, Mr. Wilt took over the management of the agricultural division.

During the seven years he was associated with the agricultural division, Mr. Wilt made many contributions to the development of the high-compression tractor and the farm program of the Ethyl Corporation.

Mr. Wilt is survived by his wife, Lucy Lee Dunn Wilt, a son Jackie, aged seven, a sister in Florida, one brother in Michigan and another brother in Texas.

Applicants for Membership

The following is a list of recent applicants for membership in the American Society of Agricultural Engineers. Members of the Society are urged to send information relative to applicants for consideration of the Council prior to election.

J. P. Bonfield. U. S. Gypsum Co., Chicago, Ill. (Mail) 612 N. Michigan.

L. E. Buxton, farm engineer, Socony-Vacuum Oil Co., Chicago, Ill. (Mail) Cole Apartments, 1257 W. Lunt Ave.

B. H. Closson, field engineer, Louden Machinery Co. (Mail) 301 Orchard St., Alma, Mich.

Tom Elleman, chief engineer, Bolens Products Company, Port Washington, Wis.

Franklin G. Floete, 1300 Walnut St., Des Moines, Iowa.

Kenneth E. Fuller, general manager, Fuller Seed Company, Lincoln, Ill. (Mail) 220 Ottawa St.

John E. Goodison, vice-president, John Goodison Thresher Co. Ltd., Sarnia, Ont., Canada. (Mail) Drawer "K".

Harrison L. Hart. manufacturers' representative, 840 N. Michigan Ave., Chicago, Ill.

J. F. Hirshfeld. chief engineer, Stran-Steel Div., Great Lakes Steel Corp., 1130 Penobscot Bldg., Detroit 26, Mich.

Oscar K. Jarrett, superintendent, John Goodison Thresher Co. Ltd., Sarnia, Ont., Canada. (Mail) 283 Maria St.

L. S. Knudsen, superintendent, John Goodison Thresher Co. Ltd., Sarnia, Ont., Canada. (Mail) 354 Confederation St.

Leonard J. Larson, assistant agricultural engineer, Soil Conservation Service, USDA. (Mail) 504 10th St., S.E., Rochester, Minn.

C. H. Leatham, vice-president, Monongohela West Penn Public Service Co., Fairmont, West Va.

R. I. Lingenfelter, special representative, International Harvester Co. (Mail) 119 Le Grande Blvd., Aurora, Ill.

W. B. Marshall, sales promotion manager, Chain Belt Co., Milwaukee, Wis. (Mail) 2314 E. Wyoming Place.

D. M. Merrill, sales manager, Successful Farming. (Mail) 333 N. Michigan Ave., Chicago, Ill.

W. S. Mole, commodity advertising manager, U. S. Gypsum Co., 300 West Adams St., Chicago, Ill.

Leland E. Morgan. assistant agricultural engineer, Louisiana State University, University Station, Baton Rouge, La.

Ole C. Nordahl, junior tool planner, Goodyear Aircraft Corp., Akron, Ohio. (Mail) Rm. 1213 Y.M.C.A.

J. J. Paterson, machinery specialist, Dominion Experimental Station, Lethbridge, Alta., Canada.

Arthur P. Scott, general manager, Beacon Steel Products Co., Westminster, Md. (Mail) College Hill.

H. L. Slaughter, district representative, Louden Machinery Co. (Mail) 2711 Ivanhoe Ave., N.W., Canton 3, Ohio.

Jacob Sosne, agricultural engineer, Princeton University. (Mail) 1718 59th St., Brooklyn, N. Y.

Pfc. Abraham J. Sprecher, Det. 17th B. Hdq. & A.B. Sq. (Sp) U. S. Army. (Mail) APO 953, c/o Postmaster, San Francisco, Calif.

Randall C. Swanson, farm safety specialist, agricultural engineering dept., University of Wisconsin, Madison 6, Wis.

Watson W. Tranter, chief engineer, A. B. Farquhar Co. Ltd., York, Pa. (Mail) 1534 Fourth Ave.

C. T. Young, agricultural engineer, Starline, Inc. (Mail) 8717 Georgia Ave., Silver Spring, Md.

TRANSFER OF GRADE

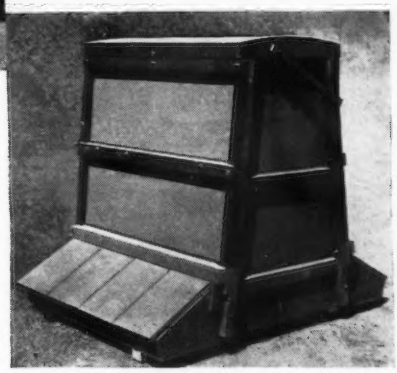
Frank B. Lanham, research associate in agricultural engineering, University of Georgia, Athens, Ga. (At present overseas with the U. S. Army) (Junior Member to Member)

C. P. Wagner, manager, farm service dept., Northern States Power Co., Minneapolis, Minn. (Mail) 2129 Girard Ave., S. (Member to Fellow)

▲ *Masonite Presdwood 4-pen hog house is easy to build.*

HEAVIER, HEALTHIER HOGS

ON LESS FEED!



Send for free plans for this Presdwood self-feeder. ▶

A GOOD, clean, warm house goes a long way toward reduced mortality and improved health among hogs. Building such a house with Masonite* Presdwoods*—the ligno-cellulose hardboards—makes it stronger and tighter and calls for fewer joints.

These tough, grainless hardboards are easy to handle, easy to work. Moisture and weather-resistant, they are long-lived. Properly applied, they will not warp, chip, split or crack. And, of course, they are rust-proof.

Masonite Corporation's Agricultural Engineers will be glad to consult with you on the proper application of Masonite Products.

MASONITE PRESDWOODS

THE LIGNO-CELLULOSE HARDBOARDS

*TRADE-MARK REG. U. S. PAT. OFF. "MASONITE" IDENTIFIES ALL PRODUCTS MARKETED BY THE MASONITE CORPORATION. COPYRIGHT 1943, MASONITE CORPORATION.

FREE PLANS—FREE SAMPLE

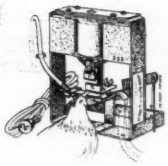
MASONITE CORPORATION, *Dept. AE-1*
111 W. Washington St., Chicago 2, Ill.
Please send free plans for the Presdwood hog house and self-feeder.

*Name*_____

*Address*_____ *R. F. D.*_____

*City*_____ *State*_____

Remember the All-Electric Lyon Line for Efficient Equipment



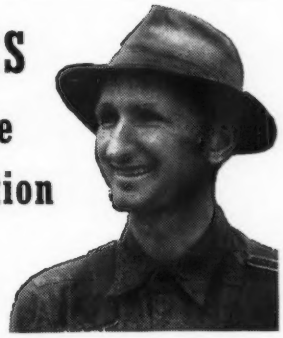
PROOF is found in:

29 YEARS OF SPECIALIZATION in ELECTRIC BROODING (and Electric Poultry Supplies)

FIRST in successful *nation-wide* electric brooders
FIRST in *cold room* electric brooding
FIRST in commercial *fan ventilated* brooders
FIRST in *infra-red ray* brooding
FIRST in *electrification* of fuel heated incubators
FIRST in *electrifiers* for homemade brooders
FIRST in *low-temperature coils* for accurate temperature control in incubators and brooders
FIRST in *dimmer resistors* for poultry lighting
FIRST in *sturdy fly electrocutors* for poultrymen
FIRST in an *inexpensive 12 amp thermostat* for food dehydrators (130°-200°)
FIRST in special electric *burglar alarms* for poultrymen
FIRST in *dust-proof self-cleaning* fan heaters for electric brooders . . . AND NOW
FIRST in *electric De-beak-ers* for more efficient poultry feeding and elimination of picking

LYON RURAL ELECTRIC CO.
DEPT. AE SAN DIEGO, CALIFORNIA
(Eastern Branch—Greensboro, North Carolina)
Headquarters for Electric Brooder Supplies

"GOOD FENCES Have Helped Me Increase Production 70 Percent!"



— states Frank Hackrott, Sioux Falls, So. Dak.

"A sure way to build up the land and get increased production is to put good fences around every field, stock the farm heavily, and rotate the crops and livestock on legume pasture," states Mr. Hackrott. "By following this plan I have increased my crop yields nearly 50 per cent in the past five years. I'm also able to carry more livestock on my 160-acre farm than ever before. Fence sure pays dividends!"

More Fence Now Available

Larger amounts of Keystone fencing materials are now being shipped to dealers, due to recent government releases of steel for fence-making purposes. While this fence is not extra-heavy-coated Red Brand because of the war demands for zinc, it is quality built with good serviceable galvanized wire—copper-bearing.

KEYSTONE STEEL & WIRE CO.
PEORIA, ILLINOIS

RED BRAND FENCE and RED TOP STEEL POSTS

PROFESSIONAL DIRECTORY

RATES: Announcements under the heading "Professional Directory" in AGRICULTURAL ENGINEERING will be inserted at the flat rate of $1.00 per line per issue; 50 cents per line to A.S.A.E. members. Minimum charge, four-line basis. Uniform style setup. Copy must be received by first of month of publication.

EMPLOYMENT BULLETIN

The American Society of Agricultural Engineers conducts an employment service especially for the benefit of its members. Only Society members in good standing may insert notices under "Positions Wanted," or apply for positions under "Positions Open." Both non-members and members seeking to fill positions, for which ASAE members are qualified, are privileged to insert notices under "Positions Open," and to be referred to members listed under "Positions Wanted." Any notice in this bulletin will be inserted once and will thereafter be discontinued, unless additional insertions are requested. There is no charge for notices published in this bulletin. Requests for insertions should be addressed to ASAE, St. Joseph, Michigan.

POSITIONS OPEN

AGRICULTURAL or MECHANICAL ENGINEERS wanted. Allis-Chalmers Harvester Division, LaPorte, Indiana, has several attractive openings for agricultural or mechanical engineers who wish to make the design and development of corn, hay, grain, silage, and other harvesting equipment their life work.

ENGINEERS WANTED in our plants in CALIFORNIA, FLORIDA, ILLINOIS and other states. Must have had at least three years' experience in general machine design. Our work is postwar development of machines for use in agriculture and in fruit and vegetable canneries, packing houses, and processing plants. Please give full history, including family, also name of state in which you prefer working, and salary expected — also snapshot of yourself if available. Reply to Food Machinery Corp., San Jose, California.

AGRICULTURAL PRODUCT ENGINEER for mechanical designing and development of corn pickers, combines, and other harvesting machines. Permanent position with old, well-established Midwest manufacturer with national distribution. Located in fine city with adequate housing and educational facilities. Big postwar farm market assures future. Salary open. Write experience, qualifications, draft status, and other particulars in your letter. PO-147

AD COPY WRITER wanted. Man with some technical experience who is creative and has the knack of writing simple, forceful copy for industrial and technical advertising is desired. Permanent position and good opportunity for advancement with long-established 4-A advertising agency. Correspondence will be kept confidential. PO-146

RESEARCH ENGINEER wanted for design and development of agricultural machinery and equipment for the Southeast. Salary up to $3,000, depending on qualifications. Persons interested are requested to write giving full particulars regarding training, experience, and other pertinent information. PO-141.

POSITIONS WANTED

AGRICULTURAL ENGINEER with B. S. in both agriculture and mechanical engineering from midwestern university. Some graduate work in engineering. Desires position in college teaching, research, or extension, or with private concern. Has had experience in soil conservation, farm machinery and equipment, farm structures, and rural electrification. At present employed as a state extension agricultural engineer. Farm reared. Married. Age 38. Good reason for desiring a change of position. References and professional record available upon request. PW-357

AGRICULTURAL MACHINERY BLOCKMAN and collector, with three years in agricultural engineering work at Kansas State College, ten years' service with largest manufacturer of farm equipment, two years teaching in national defense training, and one year with farm machinery division of WPB, desires position in industry, or in any branch of agricultural engineering, farm management, or farm machinery design. Age 40, health excellent, no defects or bad habits, married, rural background. Complete credentials furnished upon request. Available October 16, 1943. PW-356